TURBOCHARGER G-CHARGER

CHARGE AIR SYSTEM WITH TURBOCHARGER

NOTE:

- **All hose connections are secured with clamps.**
- **Charge air system must be properly sealed.**
- **Always replace self-locking nuts.**
- **Charge pressure hoses and their connections must be free of grease before re-installation.**
- **VAS5024 assembly tool or VAG1921 pliers are recommended for installing spring clips.**

Removing and installing turbocharger with attachments, see **TURBOCHARGER WITH ATTACHMENTS, REMOVING AND INSTALLING** .

Removing and installing parts of charge air cooler, see **PARTS OF CHARGE AIR COOLER, REMOVING AND INSTALLING** .

Overview plan of exhaust turbocharging system:

- Vehicles with engine code APH, see **OVERVIEW PLAN OF EXHAUST TURBOCHARGING SYSTEM (VEHICLES WITH ENGINE CODE APH)**
- Vehicles with engine code AWP, AWV, see **OVERVIEW PLAN OF EXHAUST TURBOCHARGING SYSTEM (VEHICLES WITH ENGINE CODE AWP, AWV)** .

Observe rules for cleanliness, see **RULES OF CLEANLINESS** .

Observe safety precautions, see **SAFETY PRECAUTIONS** .

NOTE:

- **All hose connections are secured with clamps.**
- **Charge air system must be properly sealed.**
- **Always replace self-locking nuts.**
- **Charge pressure hoses and their connections must be free of grease before re-installation.**
- **Components marked with * are tested via On Board Diagnostic (OBD), see DIAGNOSTIC MODE 3: CHECK DTC MEMORY .**

Turbocharger with attachments, removing and installing

Part I

The following list pertains to **Fig. 1** .

1. **40 Nm**
   - Coat threads with G 052 112 A3
2. **Seal**
   - replace
3. **10 Nm**
   - Must not be loosened
4. **Vacuum diaphragm**
   - For boost pressure regulator valve
   - Can only be replaced together with turbocharger
   - Boost pressure regulation, checking, see **BOOST PRESSURE SYSTEM, CHECKING**
5. **Fuse**
6. **Turbocharger**
   - Boost pressure regulation, checking, see **BOOST PRESSURE SYSTEM, CHECKING**
   - The boost pressure regulator valve and vacuum diaphragm for boost pressure regulator valve are part of the exhaust turbocharger and cannot be replaced individually.
   - Before connecting oil supply line, fill turbocharger with oil at filler tube
   - After installing turbocharger, let engine idle for approx. 1 minute without increasing engine speed. This ensures adequate oil supply to the turbocharger.
7. **O-ring**
   - replace
8. **10 Nm**
9. **Intake manifold**
10. **Seal**
    - replace
    - Note installed position
11. **20 Nm**
12. **Heat shield**
13. **10 Nm**
14. **Banjo fitting, 30 Nm**
15. **Oil supply line**
16. **30 Nm**
    - replace
    - Coat threads and bolt head contact surface with G 052 112 A3
17. **Exhaust manifold**
18. **Seal**

    - replace
    - Note installed position
19. **20 Nm**
20. **Banjo fitting, 30 Nm**
21. **25 Nm**
    - replace
    - Coat threads with G 052 112 A3
22. **Banjo fitting, 35 Nm**
23. **Coolant return line**
24. **25 Nm**
25. **Spacer sleeve**
26. **Banjo fitting, 35 Nm**
27. **10 Nm**
28. **Coolant supply line**
29. **Banjo fitting, 35 Nm**
30. **30 Nm**
    - use only original bolts from parts catalog
31. **Bracket**
    - Between turbocharger and cylinder block
32. **25 Nm**
33. **Seal**
    - replace
34. **Seal**
    - replace
35. **10 Nm**
36. **Oil return line**
    - To oil pan
37. **10 Nm**
38. **10 Nm**
    - Do not change orientation
    - Must not be loosened

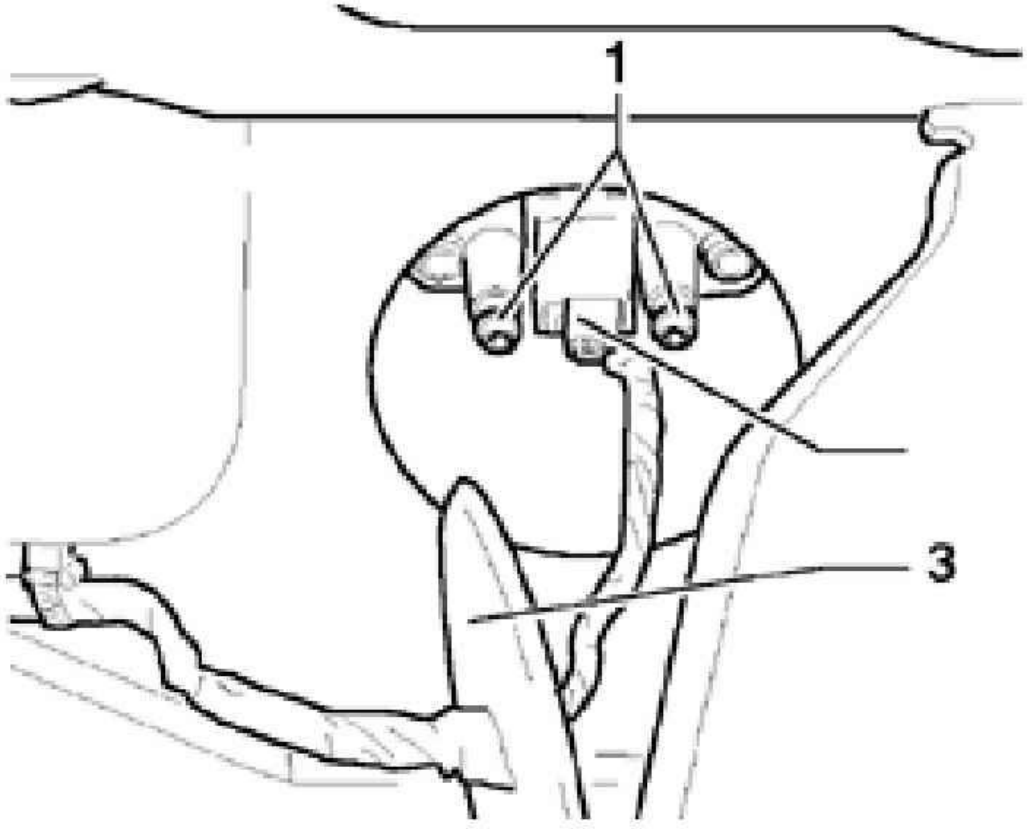


Fig. 1: Exploded View Of Turbocharger With Attachments
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Part II

Vehicles with engine code APH

Vehicles with engine code AWP, AWV, see **VEHICLES WITH ENGINE CODE AWP, AWV**

The following list pertains to **Fig. 2** .

1. **Deceleration shut-off valve**
   - Checking, see **DECELERATION SHUT-OFF VALVE, CHECKING**
2. **Connection hose**
   - To Recirculating valve for turbocharger -N249-*

3. **Pressure regulator valve**
    - For crankcase ventilation
4. **Connection hose**
    - from deceleration shut-off valve to upper air guide pipe
5. **to crankcase breather valve**
6. **From air filter**
7. **upper air guide pipe**
    - note installation position of heat shield mat
8. **Bracket**
9. **25 Nm**
10. **10 Nm**
11. **from turbocharger exhaust tube**
12. **Connection hose**
13. **Connection hose**
    - to vacuum diaphragm for boost pressure regulator valve
14. **Retaining clip**
    - Check for secure fitting
15. **O-ring**
    - replace
16. **Intake hose**
    - to intake tube of turbocharger
17. **Wastegate Bypass Regulator Valve -N75-***
    - Valve is activated (pulsed) by the Engine Control Module (ECM)
    - Closed when no voltage present, limits charge pressure
    - Checking, see **WASTEGATE BYPASS REGULATOR VALVE, CHECKING**

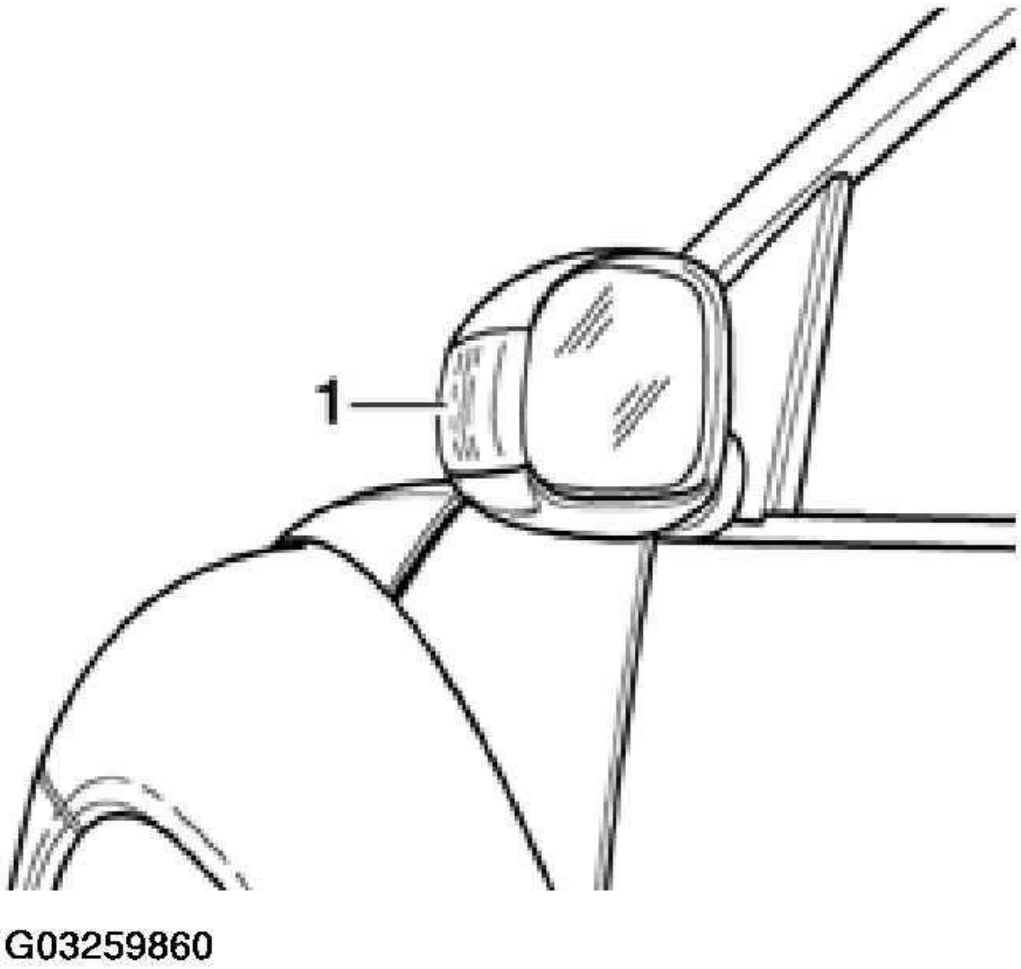


Fig. 2: Exploded View Of Turbocharger With Attachments (Part II - Engine Code APH)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Part II

Vehicles with engine code AWP, AWV

The following list pertains to **Fig. 3** .

1. **Pressure regulator valve**
   - For crankcase ventilation
2. **to crankcase breather valve**
3. **Deceleration shut-off valve**

- Checking, see **DECELERATION SHUT-OFF VALVE, CHECKING**

4. **Connection hose**
   - To Recirculating valve for turbocharger -N249-*
5. **Connection hose**
   - from deceleration shut-off valve to upper air guide pipe
6. **From air filter**
7. **upper air guide pipe**
   - note installation position of heat shield mat
   - Vehicles with engine code AWP, AWV with quick -release connection (with O-ring and retaining clip)
8. **Bracket**
9. **40 Nm**
10. **25 Nm**
11. **to connection hose for lower connection sleeve/charge air cooler**
12. **O-ring**
    - replace
13. **Retaining clip**
    - Check for secure fitting
14. **10 Nm**
15. **from turbocharger exhaust tube**
16. **Connection hose**
17. **Connection hose**
    - to vacuum diaphragm for boost pressure regulator valve
18. **Retaining clip**
    - Check for secure fitting
19. **O-ring**
    - replace
20. **Intake hose**
    - to intake tube of turbocharger
21. **Connection hose**
    - To suction jet pump
22. **Wastegate Bypass Regulator Valve -N75-**
    - Valve is activated (pulsed) by the Engine Control Module (ECM)
    - Closed when no voltage present, limits charge pressure
    - Checking, see **WASTEGATE BYPASS REGULATOR VALVE, CHECKING**

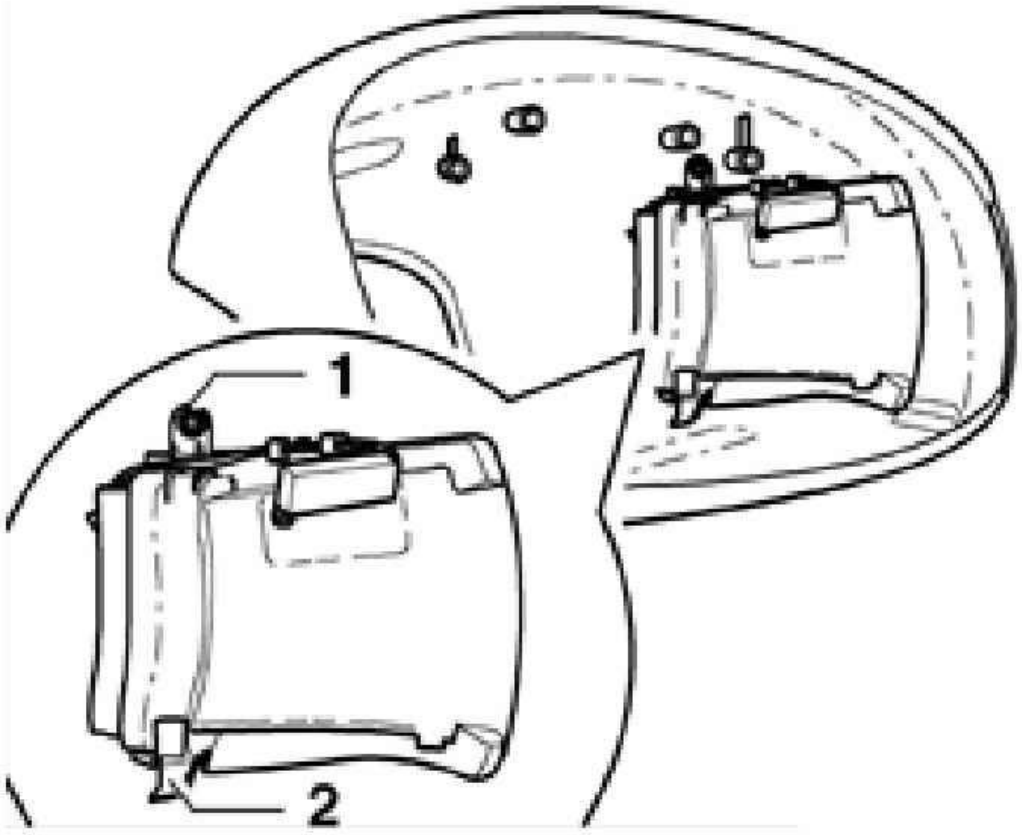


Fig. 3: Exploded View Of Turbocharger With Attachments (Part II - Engine Code AWP, AWV)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Parts of charge air cooler, removing and installing

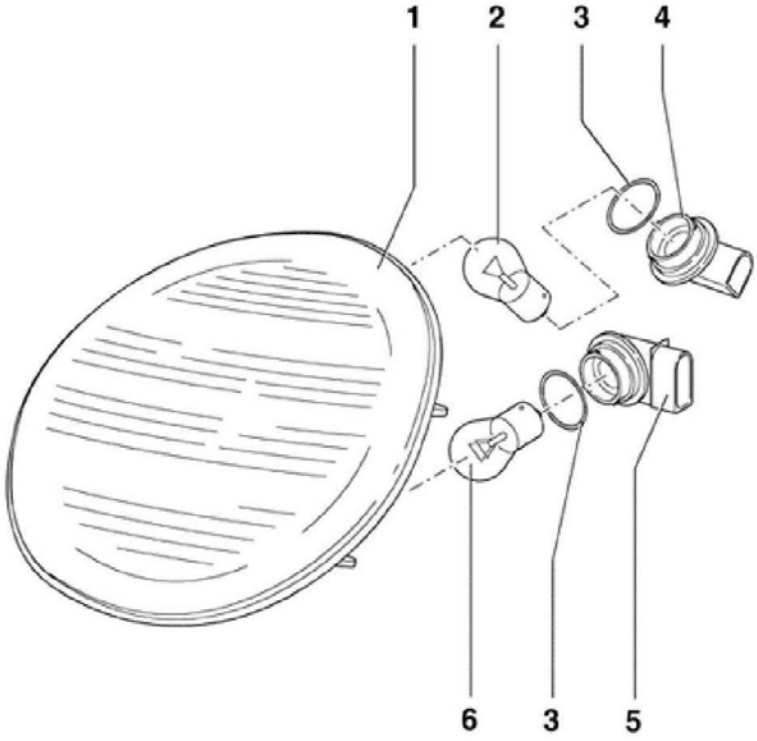
NOTE:

- **All hose connections are secured with clamps.**
- **Charge air system must be properly sealed.**
- **Note assembly markings at hoses and components during installation.**
- **Note installation position of heat shield mats**

The following list pertains to **Fig. 4** .

1. **Air duct**
2. **10 Nm**

3. **Charge Air Pressure Sensor -G31-**
    - Checking, see **CHARGE AIR PRESSURE SENSOR, CHECKING**
4. **O-ring**
    - replace
5. **Rubber grommet**
    - With sleeve
6. **10 Nm**
7. **Intake hose**
    - between intake manifold and charge air cooler
8. **Heat shield mats**
    - Note installed position
9. **Screw clamp**
    - only vehicles with engine code APH
    - Vehicles with engine code AWP, AWV with quick -release connection (with O-ring and retaining clip)
10. **Connection hose**
11. **Air duct pipe**
12. **Bracket**
13. **Connection hose**
14. **Charge air cooler**



1 - Housing

2 - Turn signal bulb

3 - O-ring

4 - Bulb holder for turn signal

5 - Bulb holder for brake light and taillight

6 - Dual filament bulb for brake light and taillight

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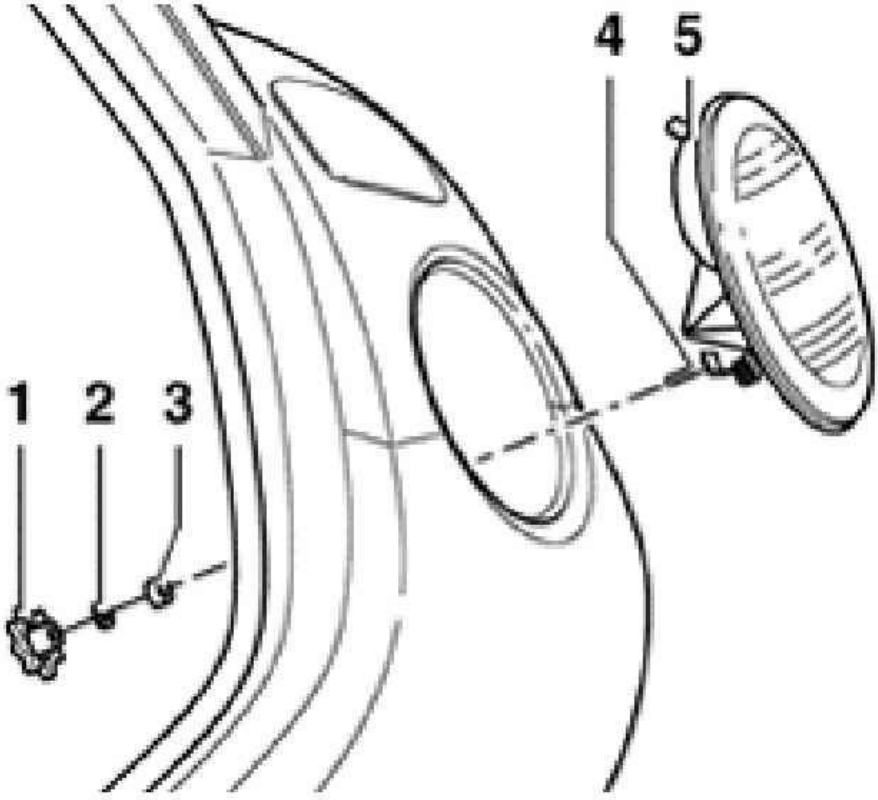
Fig. 4: Identifying Parts Of Charge Air Cooler
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Overview plan of exhaust turbocharging system (Vehicles with engine code APH)

The following list pertains to **Fig. 5** .

1. **Connection hose**
   - From the Leak detection pump (LDP) -V144-
2. **Vacuum reservoir**
   - below front right wheel housing liner
3. **Check-valve**
4. **Turbocharger**
5. **Vacuum diaphragm**
   - For boost pressure regulator valve
6. **Deceleration shut-off valve**
7. **Wastegate Bypass Regulator Valve -N75-**
   - Valve is activated (pulsed) by the Engine Control Module (ECM)
   - Closed when no voltage present, limits charge pressure
   - Checking, see **WASTEGATE BYPASS REGULATOR VALVE, CHECKING**
8. **Brake booster**
9. **Air filter with Mass Air Flow (MAF) Sensor -G70-**
10. **Pressure regulator valve for crankshaft housing ventilation**
11. **Suction jet pump**
12. **Fuel pressure regulator**
13. **Crankshaft housing ventilation**
14. **Intake manifold**
15. **Check-valve**
16. **Recirculating valve for turbocharger -N249-**
17. **Vacuum reservoir**
18. **Secondary Air Injection (AIR) Solenoid Valve -N112-**
    - Checking, see **SECONDARY AIR INJECTION (AIR) VALVE, CHECKING**
19. **Charge air cooler**
20. **Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-**
    - Checking, see **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING**



1 - Knurled nut

2 - Washer

3 - Spacer

4 - Retaining bolt

5 - Rear light

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Fig. 5: Overview Of Exhaust Turbocharging System (Vehicles With Engine Code APH)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Overview plan of exhaust turbocharging system (Vehicles with engine code AWP, AWV)

The following list pertains to **Fig. 6** .

1. **Connection hose**
   - From the Leak detection pump (LDP) -V144-
2. **Vacuum reservoir**
   - below front right wheel housing liner
3. **Check-valve**
4. **Turbocharger**
5. **Vacuum diaphragm**
   - For boost pressure regulator valve
6. **Pressure regulator valve for crankshaft housing ventilation**
7. **Wastegate Bypass Regulator Valve -N75-**
   - Valve is activated (pulsed) by the Engine Control Module (ECM)
   - Closed when no voltage present, limits charge pressure
   - Checking, see **WASTEGATE BYPASS REGULATOR VALVE, CHECKING**
8. **Brake booster**
9. **Combination valve**
   - For Secondary Air Injection (AIR) system
   - Checking, see **COMBINATION VALVE, CHECKING**
10. **Air filter with Mass Air Flow (MAF) Sensor -G70-**
11. **Check-valve**
12. **Deceleration shut-off valve**
13. **Secondary Air Injection (AIR) Pump Motor -V101-**
    - Checking function, see **SECONDARY AIR INJECTION (AIR) PUMP MOTOR, CHECKING**
14. **Suction jet pump**
15. **Crankshaft housing ventilation**
16. **Fuel pressure regulator**
17. **Intake manifold**
18. **Recirculating valve for turbocharger -N249-**
    - For Secondary Air Injection (AIR) system
    - Checking, see **COMBINATION VALVE, CHECKING**
19. **Vacuum reservoir**
20. **Secondary Air Injection (AIR) Solenoid Valve -N112-**
    - Checking, see **SECONDARY AIR INJECTION (AIR) VALVE, CHECKING**

21. **Charge Air Pressure Sensor -G31-**
    - Checking, see **CHARGE AIR PRESSURE SENSOR, CHECKING**
22. **Charge air cooler**
23. **Evaporative Emission (EVAP) Canister Purge Regulator Valve -N80-**
    - Checking, see **EVAPORATIVE EMISSION (EVAP) CANISTER PURGE REGULATOR VALVE, CHECKING**
24. **Connection hose**
    - to EVAP canister

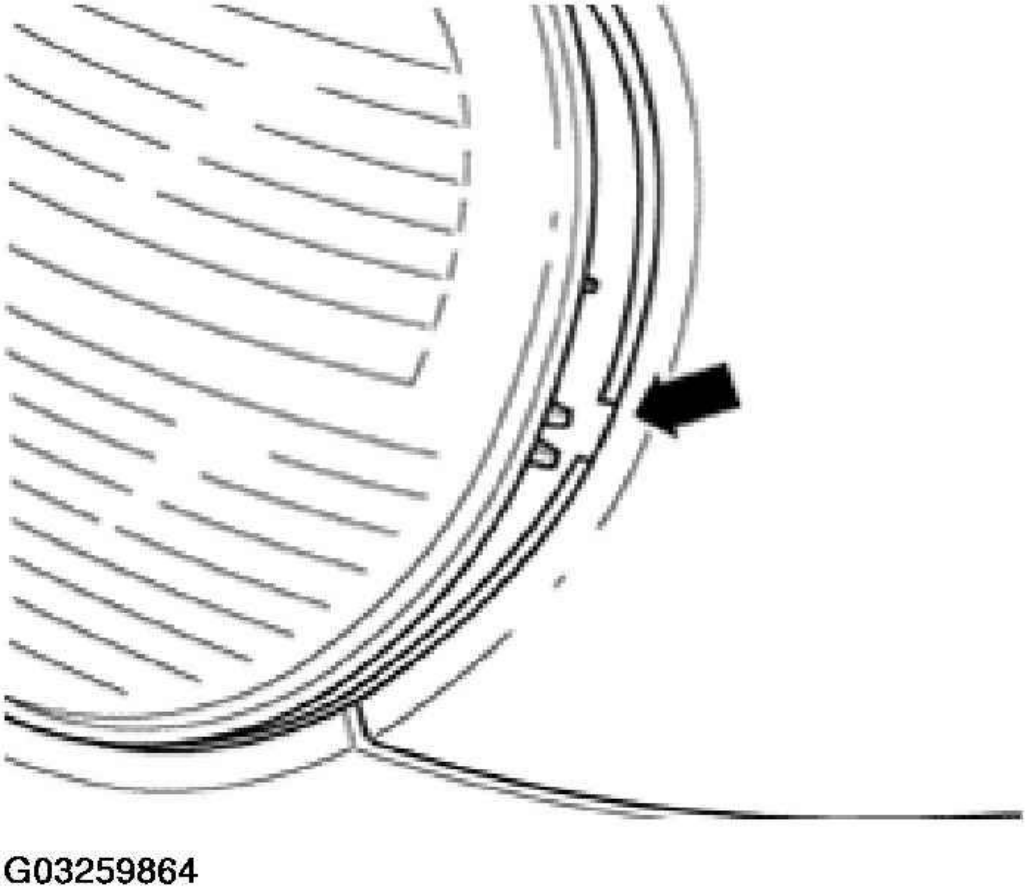


Fig. 6: Overview Of Exhaust Turbocharging System (Vehicles With Engine Code AWP, AWV)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Rules of cleanliness

When working on turbocharger, carefully observe the following "5 Rules of Cleanliness":

- Thoroughly clean all connections and the surrounding area before disconnecting.
- Place parts that have been removed on a clean surface and cover them. Use lint-free cloths only!
- Carefully cover over opened components or seal, if repairs are not performed immediately.
- Only install clean components: Only unpack replacement parts immediately prior to installation. Do not use parts that have been stored loose (in tool boxes etc.)
- When the system is open:Avoid working with compressed air. Do not move vehicle unless absolutely necessary.

Safety precautions

WARNING: Observe the following for all installations, especially in engine compartment due to lack of room:

- **Route lines of all types (e.g. for fuel, hydraulic, EVAP canister system, coolant and refrigerant, brake fluid, vacuum) and electrical wiring so that the original path is followed.**
- **Watch for sufficient clearance to all moving or hot components.**

If test and measuring equipment is required during road test, note the following:

- Test equipment must always be secured to the rear seat and operated from there by a second person.

If test and measuring equipment is operated from the passenger seat, the person seated there could be injured in the event of an accident involving deployment of the passenger -side airbag.

BOOST PRESSURE SYSTEM, CHECKING

Boost pressure regulation, checking

Recommended special tools and equipment e.g.:

- V.A.G 1397 A Turbocharger Tester

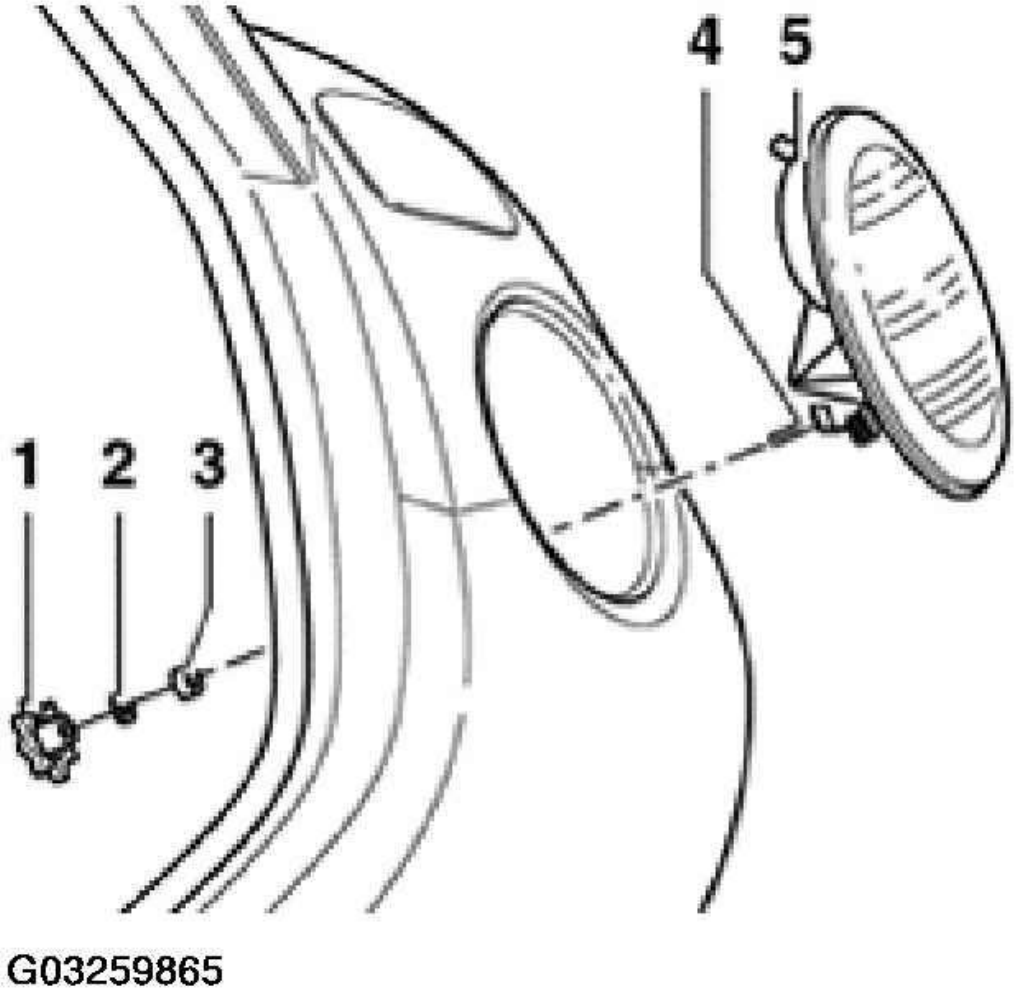


Fig. 7: Identifying V.A.G 1397 A Turbocharger Tester
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Test requirements

- No leaks on intake or exhaust side.
- Coolant temperature must be at least 80 °C, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.

Test sequence

- Charge pressure is measured under Wide Open Throttle (WOT) while driving or on the roller type test stand.

Observe the safety precautions that apply to road tests, see **SAFETY PRECAUTIONS** .

- Disconnect connection hose between intake manifold and fuel pressure regulator at intake manifold and connect to T-piece of turbocharger tester (VAG1397A).

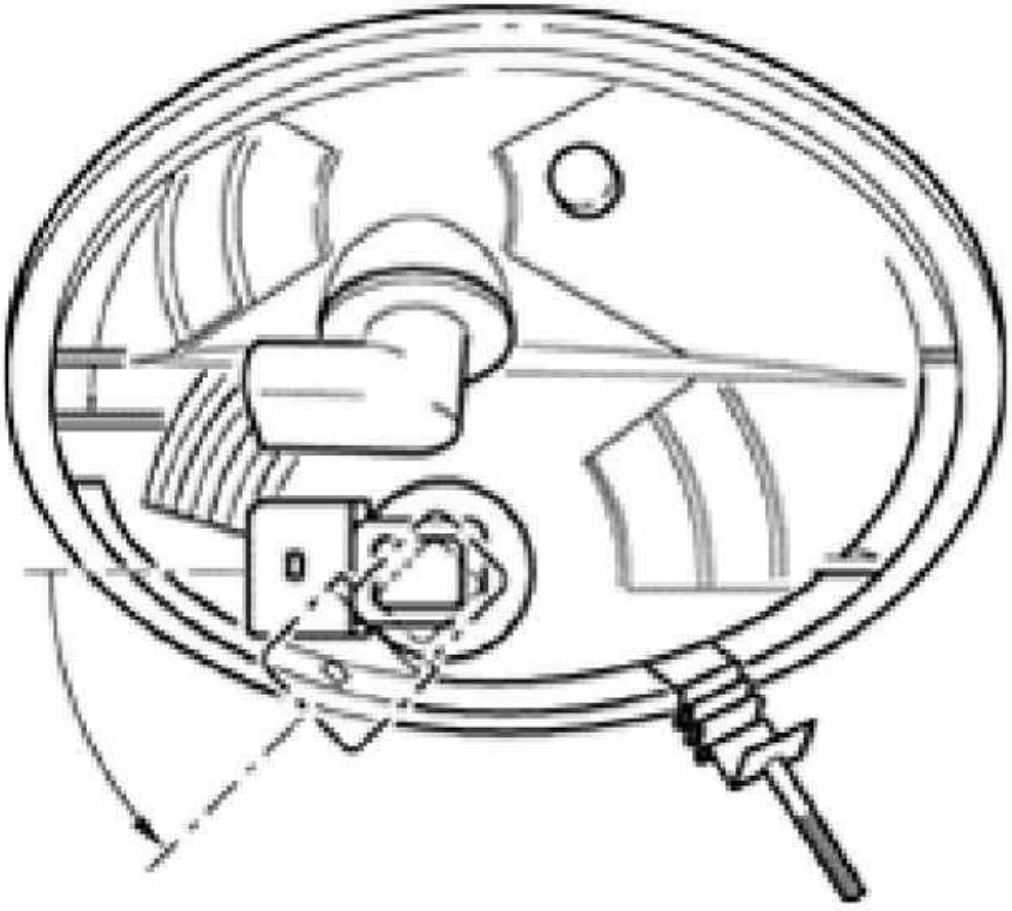


Fig. 8: Connecting To T-Piece Of Turbocharger Tester (VAG1397A)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE:

- **Using turbocharger tester, see operating instructions.**
- **The hoses must be connected absolutely free of leaks.**
- **When charge pressure is measured during the drive, a second person is necessary to operate the turbocharger tester for safety reasons.**

- **Make sure that the pressure hose is not pinched between engine hood and chassis.**

- Measure charge pressure at Wide Open Throttle (WOT):

On dynamometer

In 3rd gear or in 2nd drive mode

While driving

Vehicles with manual transmission

- Accelerate vehicle at Wide Open Throttle (WOT) in 2nd gear

  Vehicles with automatic transmission

- Manually place vehicle in 4th gear and accelerate vehicle from low speed at Wide Open Throttle (without kick down, transmission does not downshift any more).

Engine code APH

- At 3000 RPM, press the "M" memory button on turbocharger tester and read out the test value.

  Specified value: (absolute pressure)

  1.300... 1.750 bar

Engine code AWP

- Between 1800 to 2300 RPM, press the "M" memory button on turbocharger tester and read out the test value.

  Specified value: (absolute pressure)

  1.350... 2.000 bar

Engine code AWV

- Between 1800 to 2300 RPM, press the "M" memory button on turbocharger tester and read out the test value.

  Specified value: (absolute pressure)

  1.350... 1.750 bar

Continuation for all vehicles

NOTE: Repeat measurement if boost pressure was not fully charged or if the difference between actual and specified values was too large.

If boost pressure is exceeded:

- Check the Charge Air Pressure Sensor -G31-, see **CHARGE AIR PRESSURE SENSOR, CHECKING** .
- Check Wastegate Bypass Regulator Valve - N75-. (Throughput in hose from turbocharger via valve to vacuum diaphragm with connector disconnected), see **WASTEGATE BYPASS REGULATOR VALVE, CHECKING** .
- Check for proper seating of vacuum diaphragm for wastegate bypass regulator valve at turbocharger.
- Check vacuum diaphragm, see **VACUUM DIAPHRAGM FOR WASTEGATE BYPASS REGULATOR VALVE, CHECKING**
- Check bearing for shaft of wastegate bypass regulator valve in turbocharger for ease of movement. If rusted solid, replace turbocharger.
- Replace turbocharger, see item no. 6

- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

If boost pressure is not reached:

- Check the Charge Air Pressure Sensor -G31-, see **CHARGE AIR PRESSURE SENSOR, CHECKING** .
- Check Wastegate Bypass Regulator Valve - N75-, see **WASTEGATE BYPASS REGULATOR VALVE, CHECKING** .
- Check bearing for shaft of wastegate bypass regulator valve in turbocharger for ease of movement. If rusted solid, replace turbocharger.
- Replace turbocharger, see item no. 6
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Wastegate bypass regulator valve, checking

Recommended special tools and equipment:

- VAG1526 multimeter or VAG1715 multimeter
- VAG1594 connector test kit

Test sequence

- Disconnect connector -2- at Wastegate Bypass Regulator Valve -N75- (arrow).

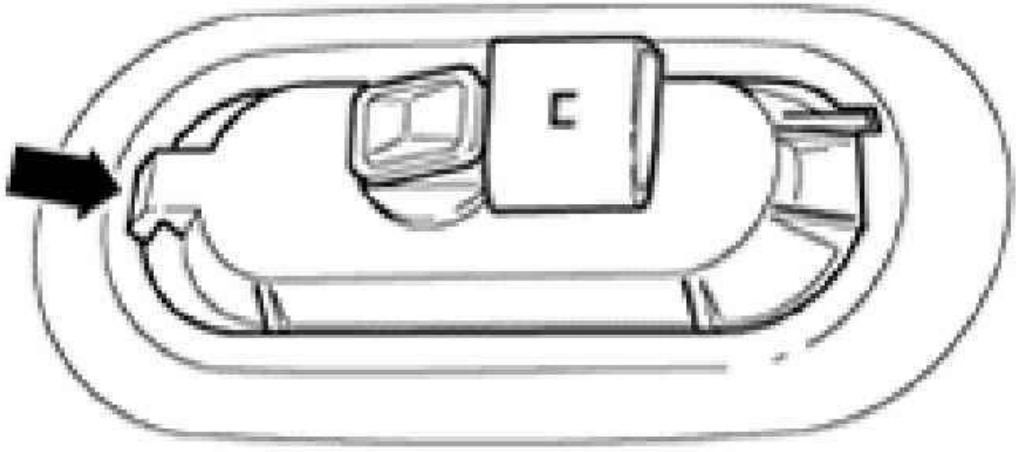


Fig. 9: Disconnecting Connector At Wastegate Bypass Regulator Valve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Measure resistance between terminals of valve.

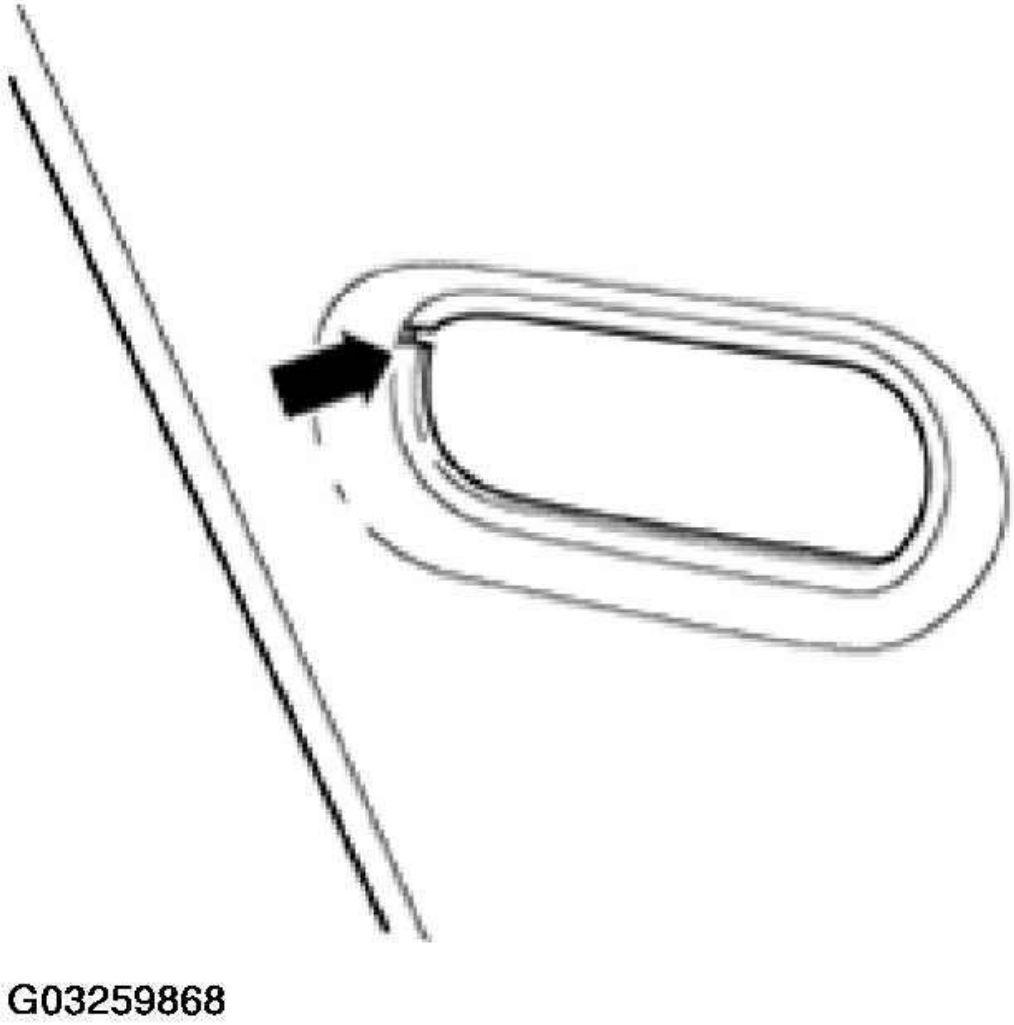


Fig. 10: Measuring Resistance Between Wastegate Bypass Regulator Valve Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Specified value: 25...35 ohm

If specified value is not obtained:

- Replace Wastegate Bypass Regulator Valve -N75-
  - Vehicles with engine code APH, see item 17 ,
  - Vehicles with engine code AWP, AWV, see item 22 .
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE**

DIAGNOSTIC DATA .

- Generate readiness code, see **READINESS CODE, GENERATING** .

Charge air pressure sensor, checking

Recommended special tools and equipment e.g.:

- VAG1526 multimeter or VAG1715 multimeter
- VAG1594 connector test kit
- Wiring diagram

Checking voltage supply and wiring to control module

- Disconnect 4-pin connector -2- from Charge Air Pressure Sensor -G31- (-1-).

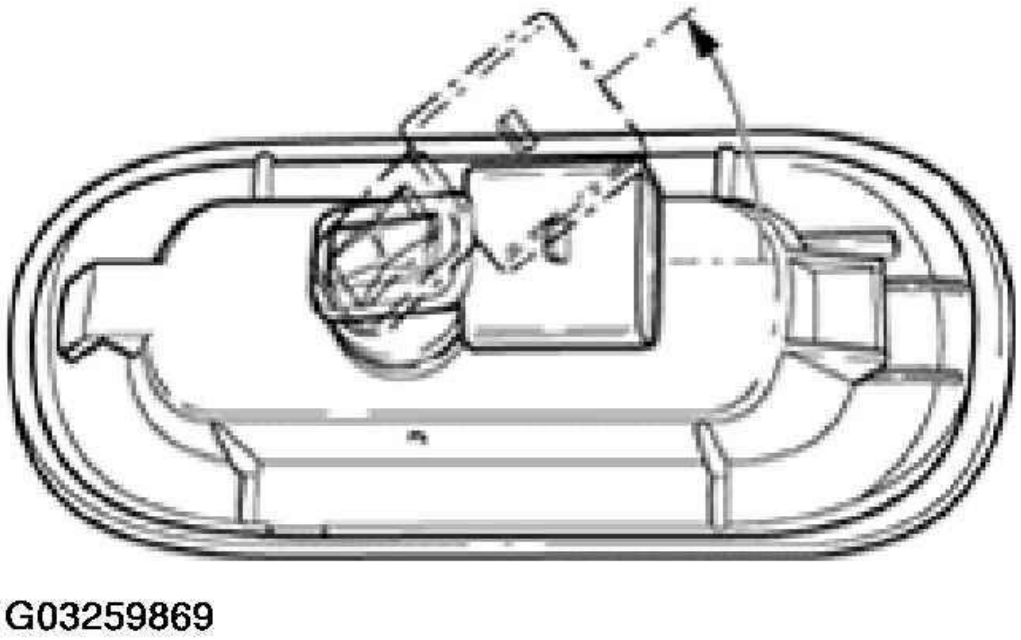


Fig. 11: Disconnecting 4-Pin Connector From Charge Air Pressure Sensor
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Use adapter cables from (VAG1594) to connect multimeter to terminals 1 + 3 of connector for voltage measurement.
- Switch ignition on.

Specified value: at least 4.5 V

- Switch ignition off.

  If there is no voltage:

- Connect test box to control module wiring harness, see **CONNECT TEST BOX FOR WIRING TEST** .

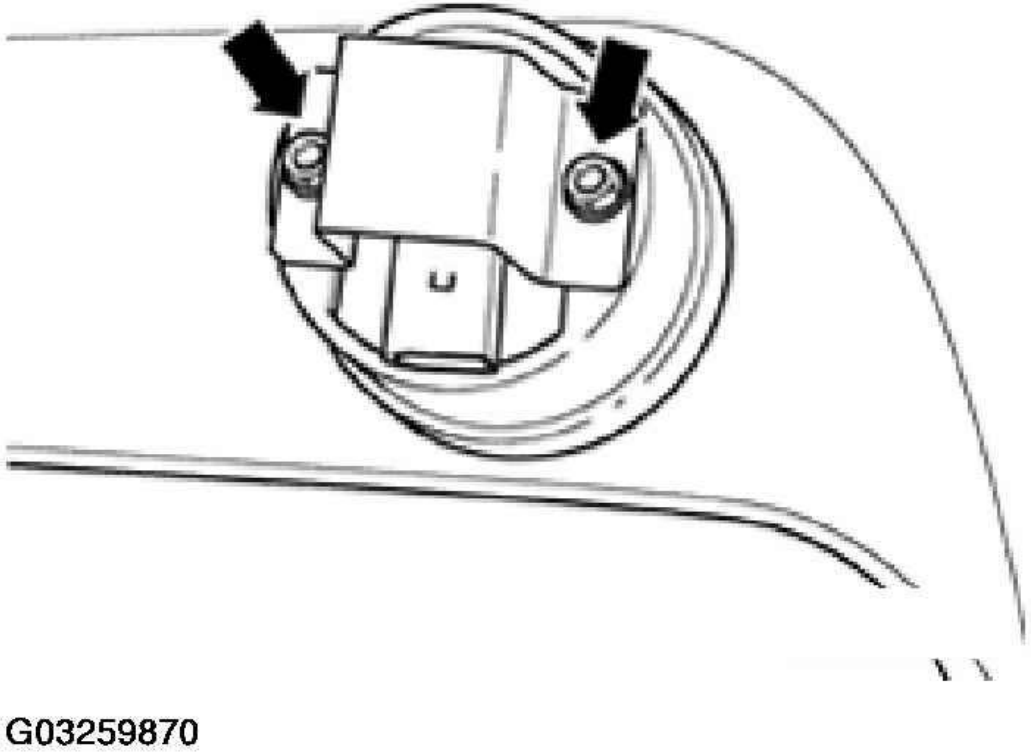


Fig. 12: Measuring Voltage Between Charge Air Pressure Sensor Harness Connector Terminals 1 And 3
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check for open circuits in wires between test box and connector according to wiring diagram.

  Terminal 1+socket 108

  Terminal 3 + socket 98

  Terminal 4 + socket 101

Wire resistance: max. 1.5 ohm

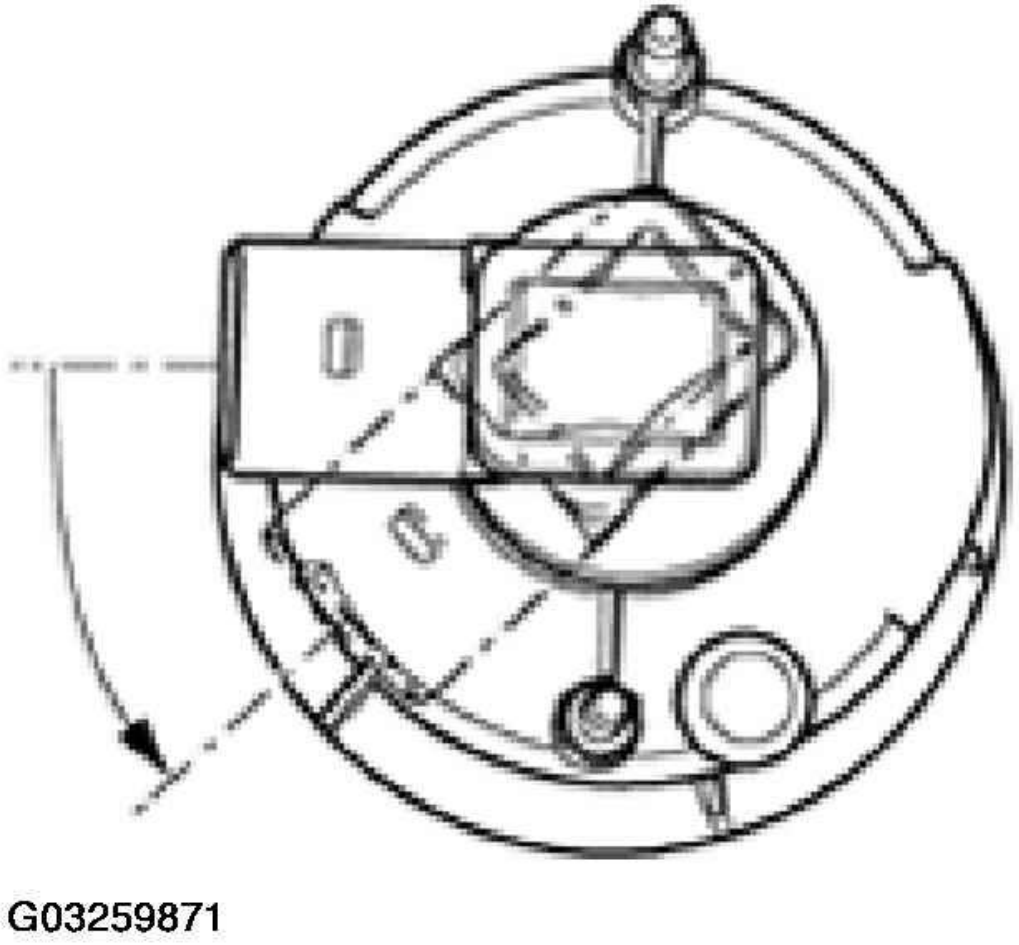


Fig. 13: Identifying Charge Air Pressure Sensor Harness Connector Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check wires for short circuit to each other.

If no malfunctions are found in the wires and there was voltage between terminals 1 + 3:

- Check function, see **CHECKING FUNCTION**

  If no malfunctions are found in wires and there was no voltage between terminals 1 + 3:

- Replace Motronic Engine Control Module (ECM) -J220-, see **REPLACING ENGINE CONTROL**

MODULE (ECM) .

Checking function

- Connect test box to control module wiring harness, see **CONNECT TEST BOX FOR WIRING TEST** .
- Re-connect connector at Charge Air Pressure Sensor -G31-.
- Use adapter cables from VAG1594 to connect multimeter to sockets 101 (B+) + 108 (Ground -GND-) for voltage measurement.
- Start engine and measure voltage.

  Specified value: 1.80 to 2.00 volts

- Bring engine to RPM by depressing accelerator pedal suddenly.

  Specified value: 2.00 to 3.00 volts

  If specified values are not obtained:

- Replace Charge Air Pressure Sensor -G31-, see item 3
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

Recirculating valve for turbocharger, checking

Valve opens between connection to intake manifold and connection to deceleration shut-off valve with no voltage. Connection to vacuum reservoir is closed.

Test sequence

- Switch ignition off.
- Disconnect connector from Recirculating valve for turbocharger -N249-.
- Measure resistance between terminals of valve.

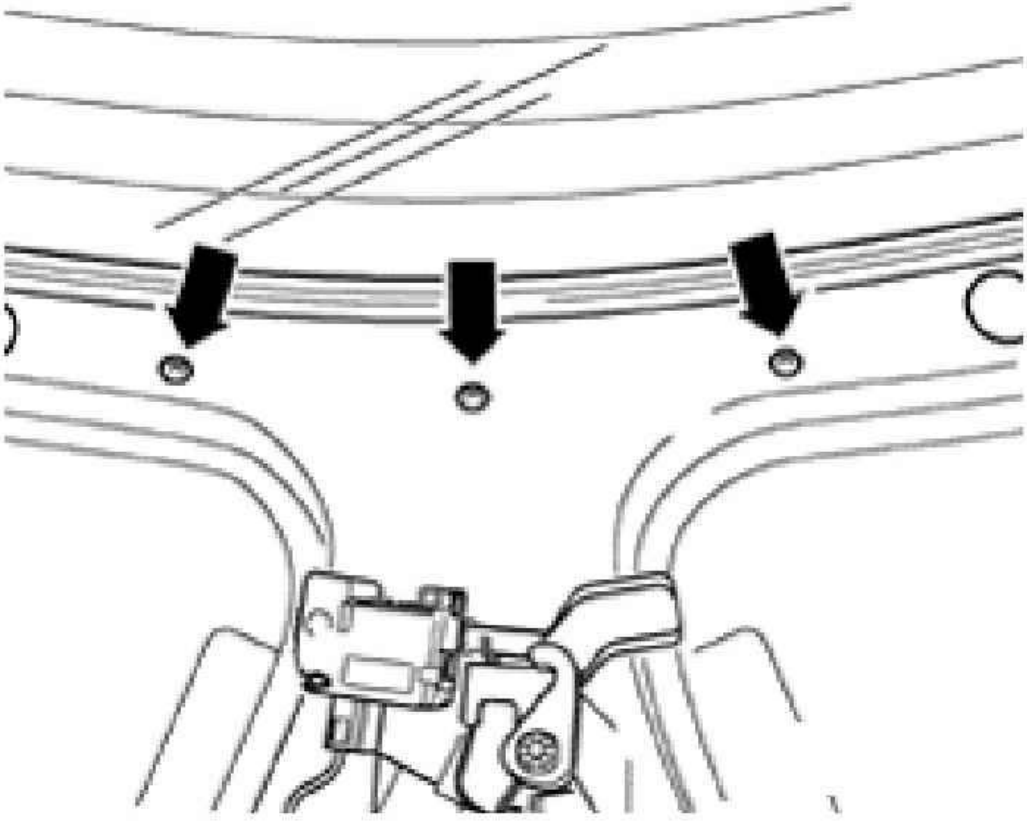


Fig. 14: Measuring Resistance Between Terminals Of Turbocharger Recirculating Valve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Specified value: 25...35 ohm

If specified value is not obtained:

- Replace Recirculating valve for turbocharger -N249-:
  - Vehicles with engine code APH, see item 16
  - Vehicles with engine code AWP, AWV, see item 16
- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .

If specified values are obtained:

- Connect test box to control module wiring harness, see **CONNECT TEST BOX FOR WIRING TEST** .
- Check wire between test box socket 105+2-pin connector terminal 2 for open circuit according to wiring diagram.

  Wire resistance: max. 1.5 ohm

- Also check the wire for short circuit to B+ and Ground (GND).

  If no malfunctions are found in wire:

- Check wire between 2-pin connector terminal 1 and the Fuel Pump (FP) Relay -J17- for open circuit according to wiring diagram.

  Wire resistance: max. 1.5 ohm

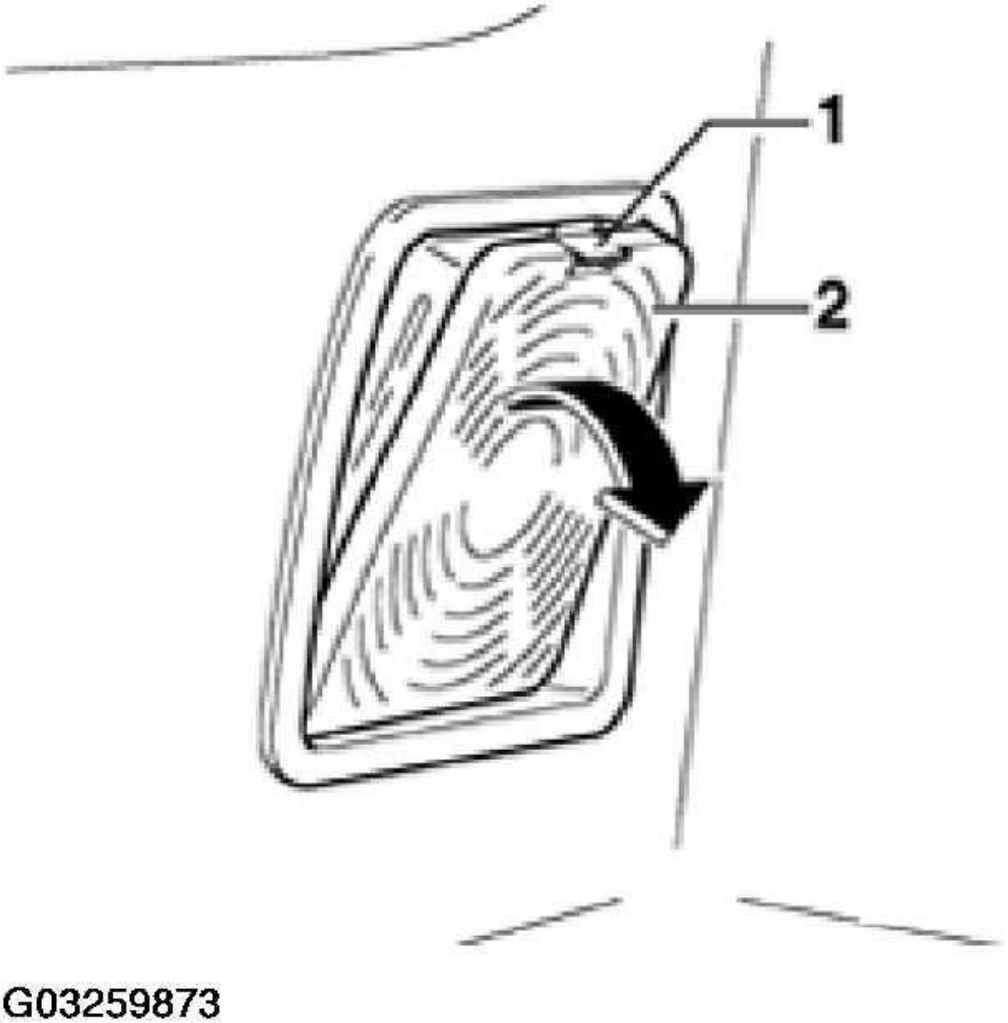


Fig. 15: Identifying 2-Pin Turbocharger Recirculating Valve Harness Connector Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

If no malfunctions are found in wires:

- Replace Engine Control Module (ECM), see **REPLACING ENGINE CONTROL MODULE (ECM)** .

Vacuum diaphragm for wastegate bypass regulator valve, checking

Recommended special tools and equipment e.g.:

- VAG1526 multimeter or VAG1715 multimeter

- VAG1594 connector test kit

Test requirements

- Coolant temperature must be at least 80 C, see **DIAGNOSTIC MODE 1: CHECK MEASURED VALUES** ; PID 5, Coolant temperature.
- No leaks on intake or exhaust side.

Test sequence

- Disconnect connector -2- at Wastegate Bypass Regulator Valve -N75- (-1-).

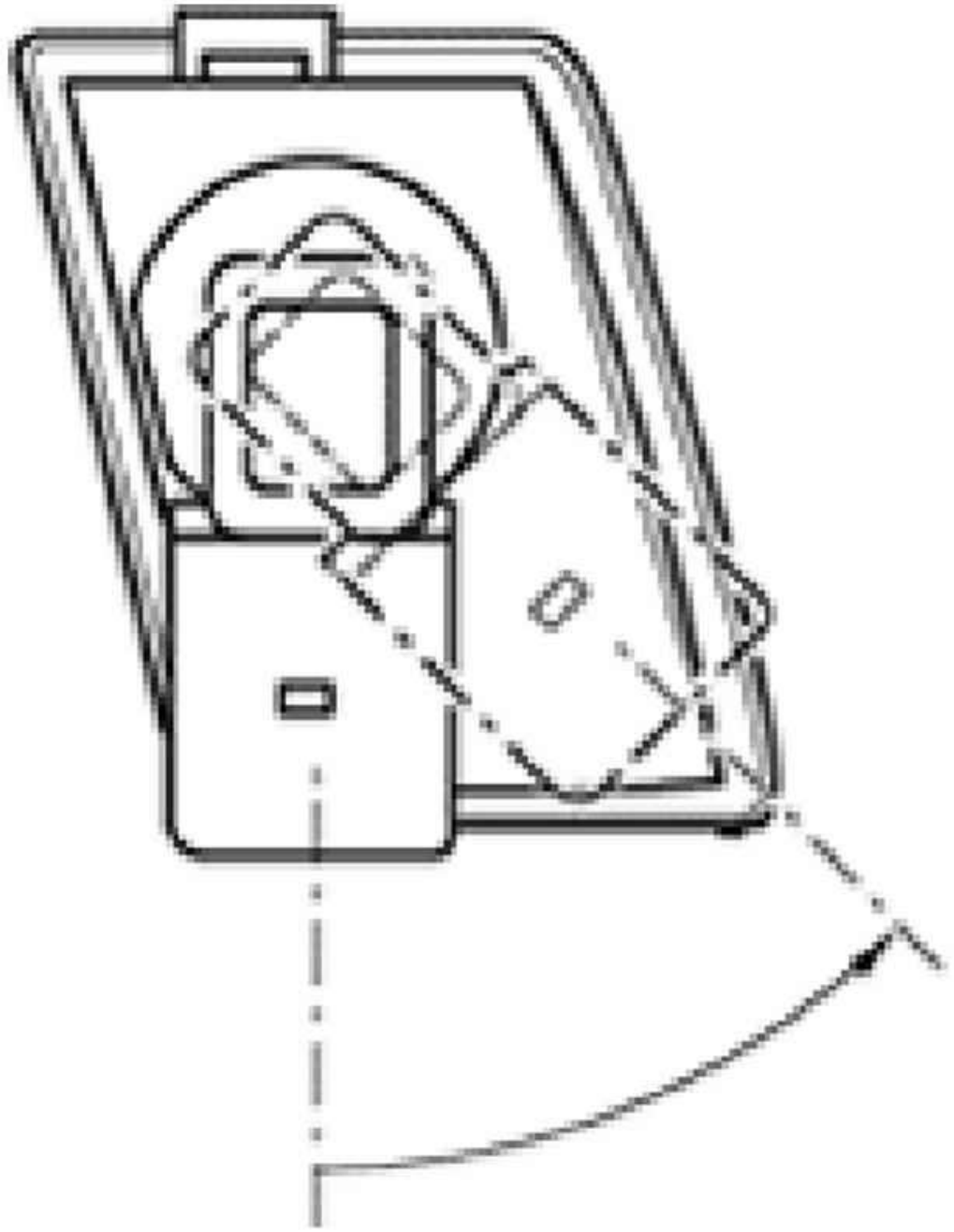


Fig. 16: Disconnecting Connector At Wastegate Bypass Regulator Valve

Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Start engine and increase speed to maximum RPM by depressing accelerator pedal suddenly. Operating rod -2- for wastegate bypass regulator valve must move.

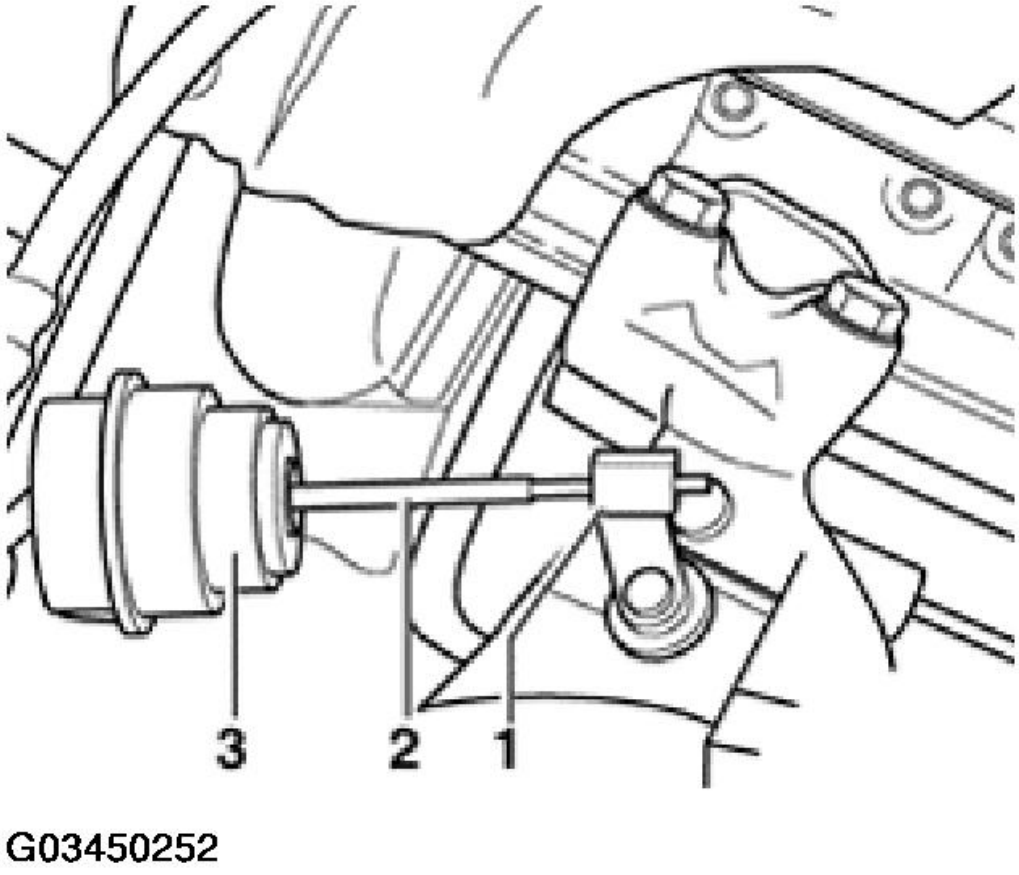


Fig. 17: Identifying Bypass Regulator Valve Operating Rod
Courtesy of VOLKSWAGEN OF AMERICA, INC.

If operating rod does not move:

- Check lever for wastegate bypass regulator valve -1- for ease of movement. If rusted solid, replace turbocharger.

If operating rod does not move despite freely moving lever:

- Replace turbocharger, see item no. 6

- Erase DTC memory of Engine Control Module (ECM), see **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code, see **READINESS CODE, GENERATING** .
- Check DTC memory:

Deceleration shut-off valve, checking

Recommended special tools and equipment e.g.:

- VAG1390 hand vacuum pump

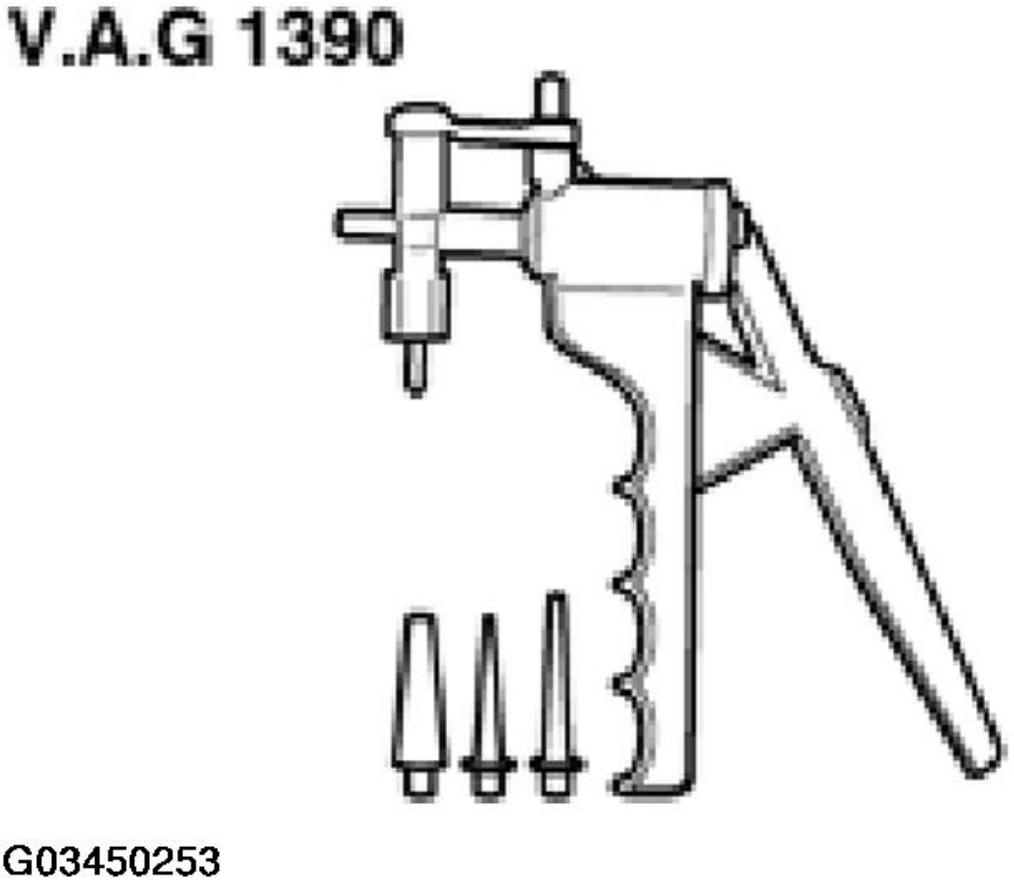


Fig. 18: Identifying VAG1390 Hand Vacuum Pump
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Test requirement

- Performance deficiency or tip-in shocks

Test sequence

NOTE: The deceleration shut-off valve is located in front of the turbocharger. It is opened by vacuum during deceleration and at idle.

- Connect hand vacuum pump (VAG1390) to vacuum connection for deceleration shut -off valve.

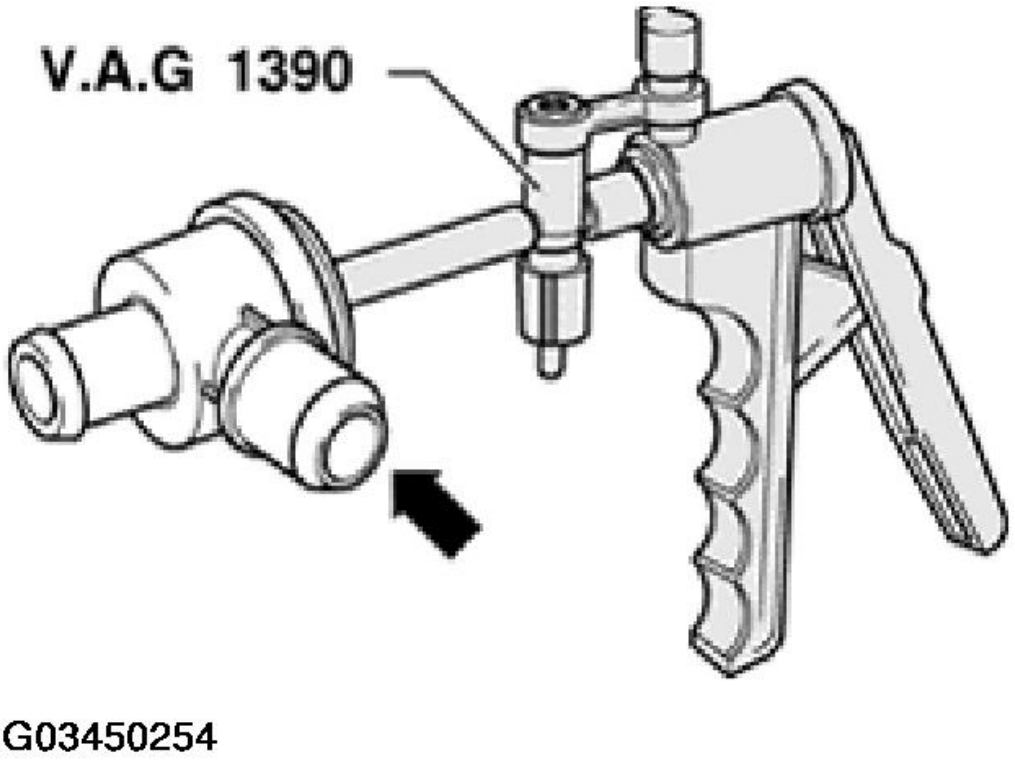


Fig. 19: Connecting Hand Vacuum Pump (VAG1390) To Deceleration Shut-Off Valve Vacuum Connection
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Operate vacuum pump.

  Deceleration shut-off valve must open in direction of arrow

- Operate ventilation valve at vacuum pump.

Deceleration shut-off valve must close

If deceleration shut -off valve does not open or does not close, replace valve, see **VEHICLES WITH ENGINE CODE APH** .

NOTE: Secure connections of deceleration valve using screw-type clamps.

TURBOCHARGER G-CHARGER

CHARGE AIR SYSTEM WITH TURBOCHARGER

WARNING: Observe the following for all installations, especially in engine compartment due to dense construction:

- **Route lines of all types (e.g. for fuel, hydraulics, coolant and refrigerant, brake fluid, vacuum) and electrical wiring so that the original path is re-established.**
- **Watch for sufficient clearance to all moving or hot components.**

Turbocharger with attachments, removing and installing

Observe rules for cleanliness. See **RULES OF CLEANLINESS** .

NOTE:

- **All hose connections are secured with clamps.**
- **VAS5024A spring clip installation tool is recommended for installing spring-type clamps.**

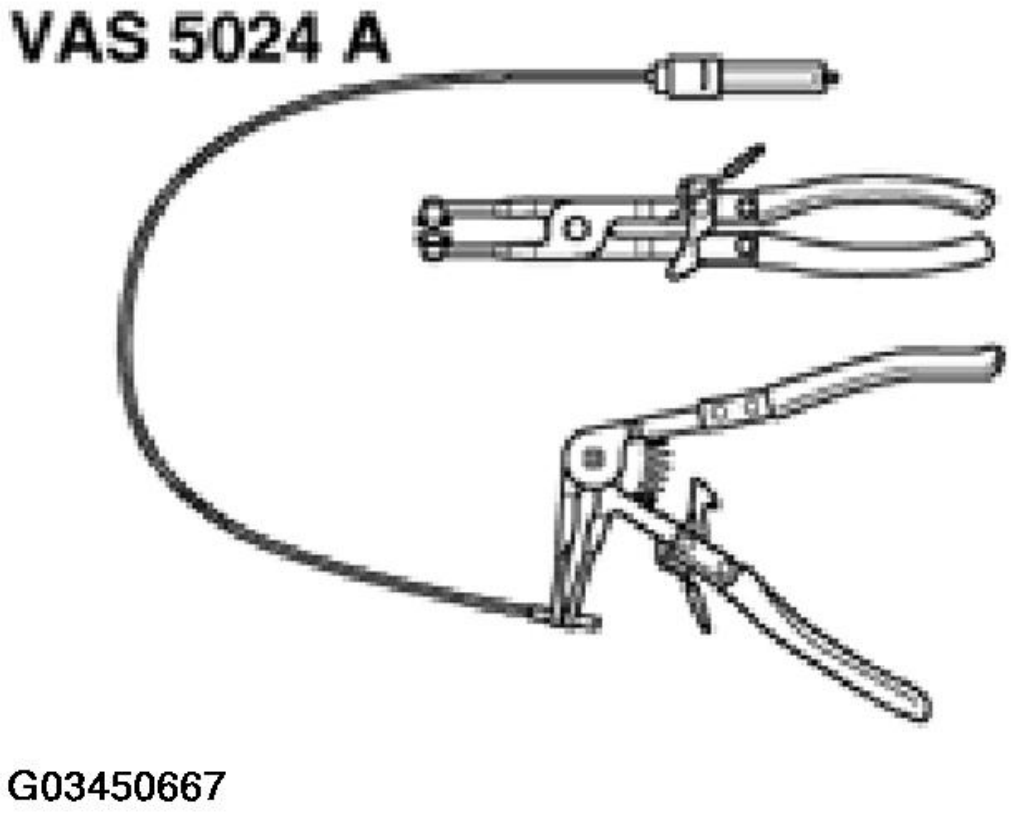


Fig. 1: Identifying Special Tool VAS5024A
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- **Charge air system must be properly sealed.**
- **Charge pressure hoses and pipes as well as their connections must be free of oil and grease before re-installation.**
- **Always replace self-locking nuts.**

Assembly overview

NOTE: The following list refers to Fig. 2 .

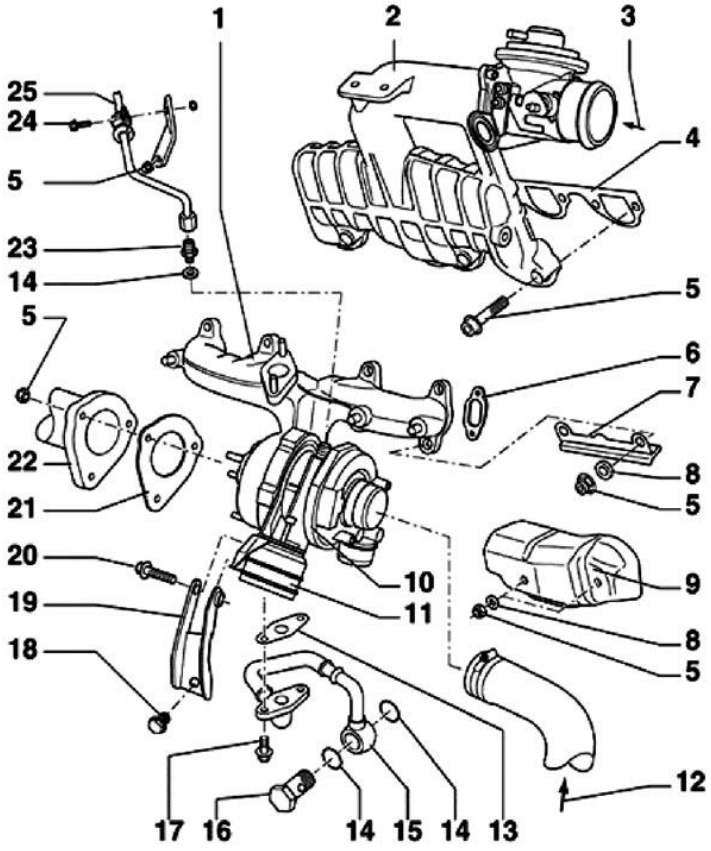
1. **Exhaust manifold**
   - with turbocharger
   - Replace as complete unit only
2. **Intake manifold**

3. **From charge air cooler**
4. **Gasket**
   - replace
   - Coating (bead) to intake manifold
5. **25 Nm**
6. **Gasket**
   - Note installed position
7. **Bracket**
   - For shielding plate, item no. 9
8. **Washer**
9. **Heat shield**
   - Engages in bracket, item no. 7
10. **Turbocharger**
    - Replace as complete unit with exhaust manifold only
    - To remove the exhaust turbocharger, disconnect right drive axle from transmission:

    See **FRONT AXLE SHAFT** .

    - After installing turbocharger, let engine idle for approx. 1 minute without increasing engine speed. This ensures adequate oil supply to the turbocharger.
11. **Vacuum diaphragm**
    - For boost pressure regulation
    - Part of turbocharger, cannot be replaced
12. **From air filter**
13. **Gasket**
    - replace
14. **Seal**
    - replace
15. **Oil return line**
    - to cylinder block
    - new version. See **New version of oil return line and support** .
16. **Banjo fitting, 40 Nm**
17. **15 Nm**
18. **40 Nm**
19. **Brace**
    - Turbocharger - cylinder block
    - new version. See **New version of oil return line and support** .
20. **25 Nm**

21. **Gasket**
    - replace
22. **Front exhaust pipe**
23. **Connecting piece**
    - Coat threads and bolt head contact surface with G 052 112 A3
24. **10 Nm**
25. **Oil supply line**
    - Before installing, fill turbocharger with oil at connection of oil supply line
    - Tighten to 22 Nm



1 - Exhaust manifold
2 - Intake manifold
3 - From charge air cooler
4 - Gasket
5 - 25 Nm
6 - Gasket
7 - Bracket
8 - Washer
9 - Heat shield
10 - Turbocharger
11 - Vacuum diaphragm
12 - From air filter
13 - Gasket
14 - Seal
15 - Oil return line
16 - Banjo fitting, 40 Nm
17 - 15 Nm
18 - 40 Nm
19 - Brace
20 - 25 Nm
21 - Gasket
22 - Front exhaust pipe
23 - Connecting piece
24 - 10 Nm
25 - Oil supply line

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Fig. 2: Exploded View Of Turbo Charger & Exhaust Manifold Components
Courtesy of VOLKSWAGEN OF AMERICA, INC.

New version of oil return line and support

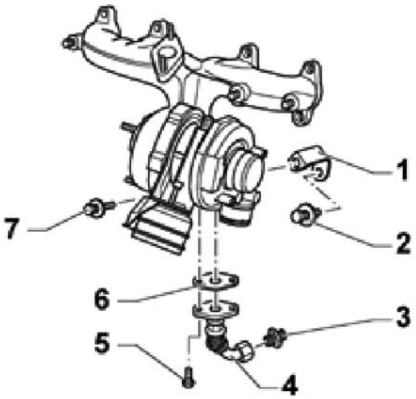
1. Support for turbocharger - cylinder block
2. 40 Nm
3. Connection, 40 Nm
4. Oil return line with union nut

   Tighten to 30 Nm on cylinder block

5. 15 Nm
6. Gasket

   replace

7. 25 Nm



1 - Support for turbocharger - cylinder block
2 - 40 Nm
3 - Connection, 40 Nm
4 - Oil return line with union nut
Tighten to 30 Nm on cylinder block
5 - 15 Nm
6 - Gasket
replace
7 - 25 Nm

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Fig. 3: Identifying Oil Return Line And Support
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Parts of charge air cooler, removing and installing

NOTE:

- **All hose connections are secured with clamps.**
- **Charge air system must be properly sealed.**

NOTE: The following list refers to Fig. 4 .

1. **Connection hose**
2. **Connection tube**

- Charge air cooler/intake manifold
- To remove, remove right headlight

3. **O-ring**
   - Replace if damaged
4. **Intake Air Temperature (IAT) Sensor -G72-**
   - Vehicles of model year 2000 and up at charge air cooler
5. **5 Nm**
6. **Connection hose**
   - Connection pipe/intake manifold
7. **Connection hose**
   - Charge air pipe/turbocharger
8. **10 Nm**
9. **Charge air pipe**
10. **Connection hose**
11. **Bracket**
12. **Charge air cooler**

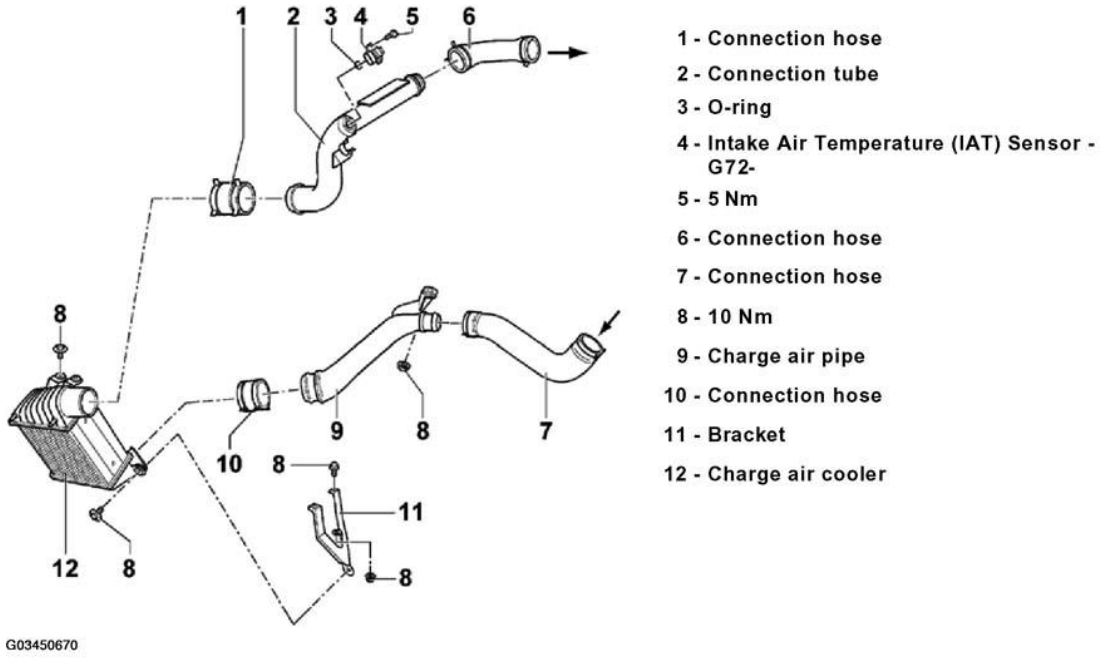
1 - Connection hose
2 - Connection tube
3 - O-ring
4 - Intake Air Temperature (IAT) Sensor - G72-
5 - 5 Nm
6 - Connection hose
7 - Connection hose
8 - 10 Nm
9 - Charge air pipe
10 - Connection hose
11 - Bracket
12 - Charge air cooler
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Fig. 4: Identifying Parts Of Charge Air Cooler Components
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Line connections of turbocharger

NOTE: The following list refers to Fig. 5 .

1. Wastegate Bypass Regulator Valve -N75-
2. To EGR Vacuum Regulator Solenoid Valve -N18-
3. To air filter
4. Vacuum reservoir
5. Vacuum diaphragm for charge pressure regulator valve
6. Turbocharger
7. To Change-over valve for intake manifold flap -N239-
8. Check valve, white connection faces toward Wastegate Bypass Regulator Valve -N75-

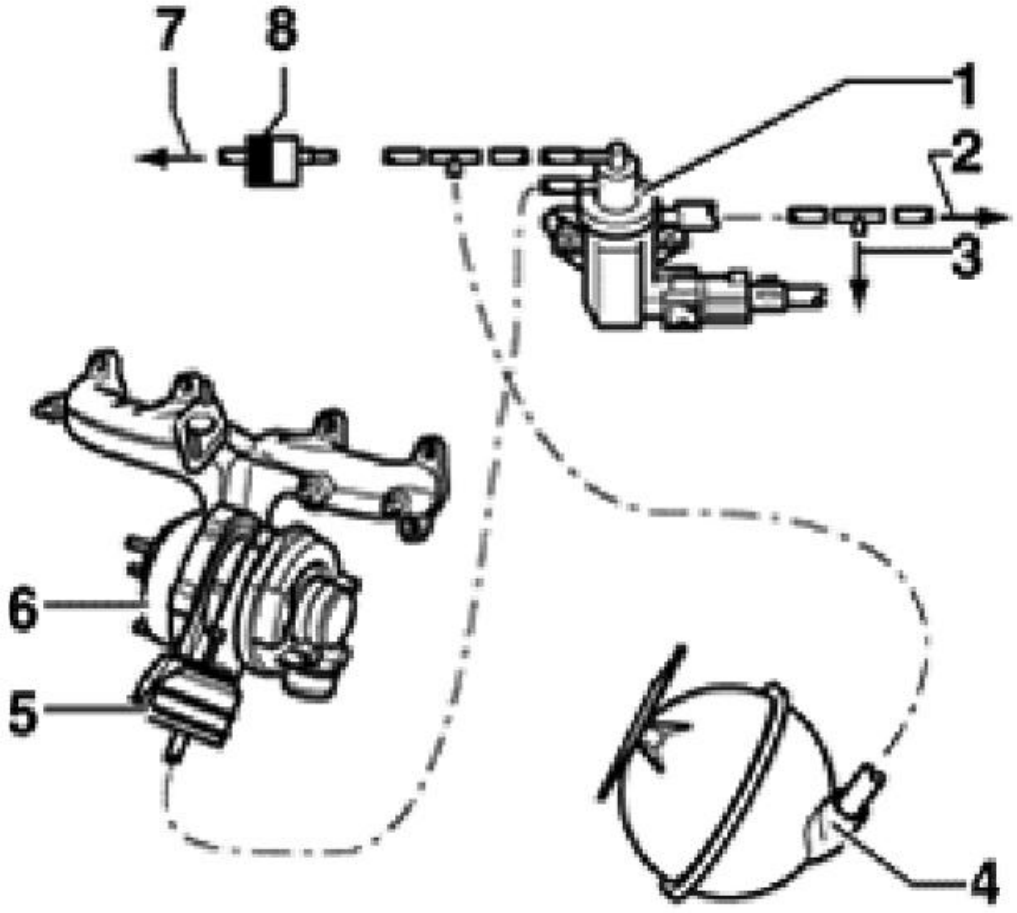

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Fig. 5: Identifying Line Connections Of Turbocharger
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Rules of cleanliness

When working on turbocharger, carefully observe the following "5 Rules of Cleanliness":

- Thoroughly clean all connections and the surrounding area before disconnecting.
- Place parts that have been removed on a clean surface and cover them. Use lint-free cloths only!
- Carefully cover opened components or seal, if repairs are not performed immediately.
- Only install clean components: Only unpack replacement parts immediately prior to installation. Do not use parts that have been stored without packaging (in tool boxes etc.)
- When the system is open: Avoid working with compressed air. Do not move vehicle unless absolutely necessary.

Safety precautions

WARNING: Observe the following for all installations, especially in engine compartment due to dense construction:

- **Route lines of all types (e.g. for fuel, hydraulics, coolant and refrigerant, brake fluid, vacuum) and electrical wiring so that the original path is re-established.**
- **Watch for sufficient clearance to all moving or hot components.**

If test and measuring equipment is required during road test, note the following:

- Test equipment must always be secured to the rear seat and operated from there by a second person.

If test and measuring equipment is operated from the passenger seat, the person seated there could be injured in the event of an accident involving deployment of the passenger-side airbag.

BOOST PRESSURE SYSTEM, CHECKING

Wastegate bypass regulator valve, checking

Recommended special tools and equipment:

- VAG1526 multimeter or VAG1715 multimeter
- VAG1594 connector test kit

Test sequence

- Switch ignition off.
- Disconnect connector (arrow) from wastegate bypass regulator valve.

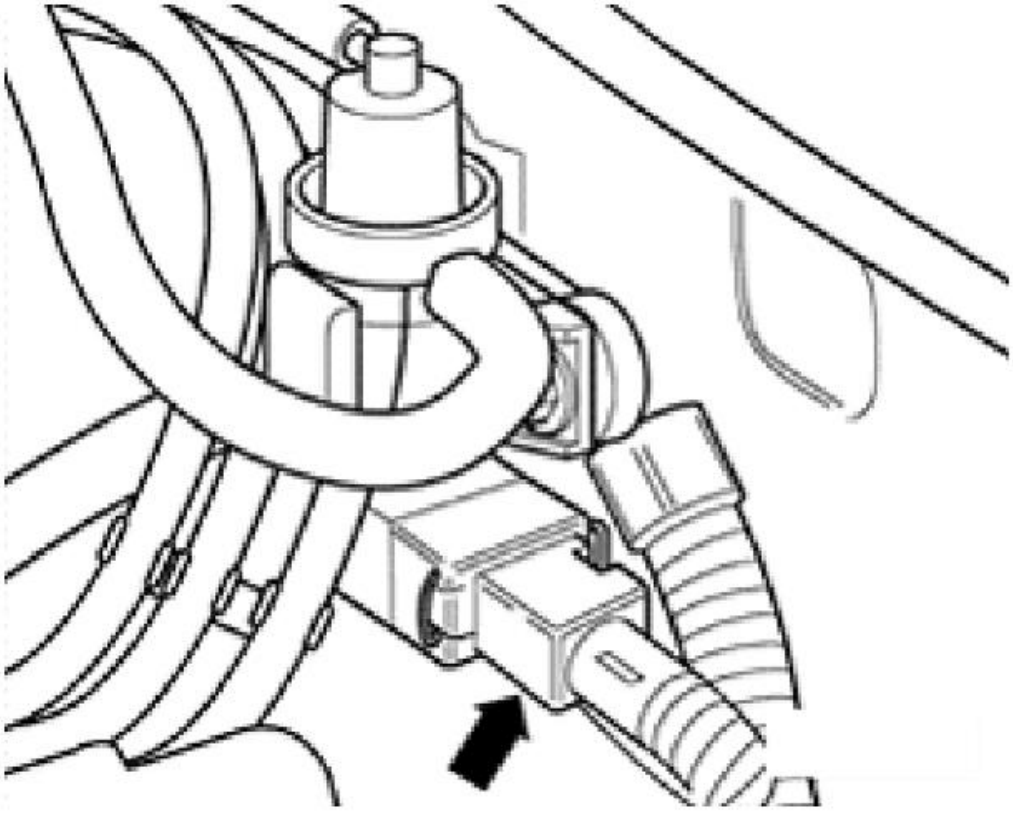

Fig. 6: Disconnecting Connector From Wastegate Bypass Regulator Valve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Measure resistance between terminals of valve.

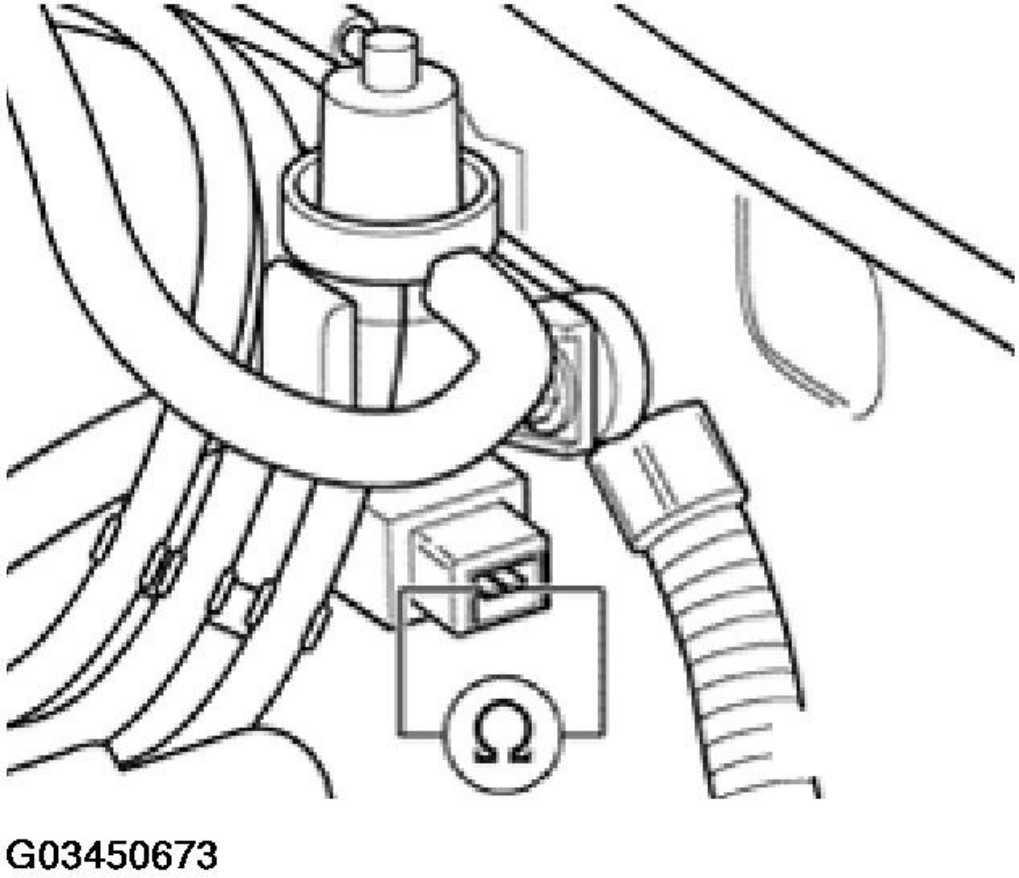

Fig. 7: Measuring Resistance Between Terminals Of Wastegate Bypass Regulator Valve
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Specified value: 14...20 ohm

If specified value is not obtained:

- Replace Wastegate Bypass Regulator Valve -N75-.
- Erase DTC memory of control module for Diesel-Direct fuel injection system. See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

If specified value is obtained:

- Switch ignition on.

- Measure voltage supply of valve at connector terminal 1 and at engine Ground (GND).

  Specified value: approx. battery voltage

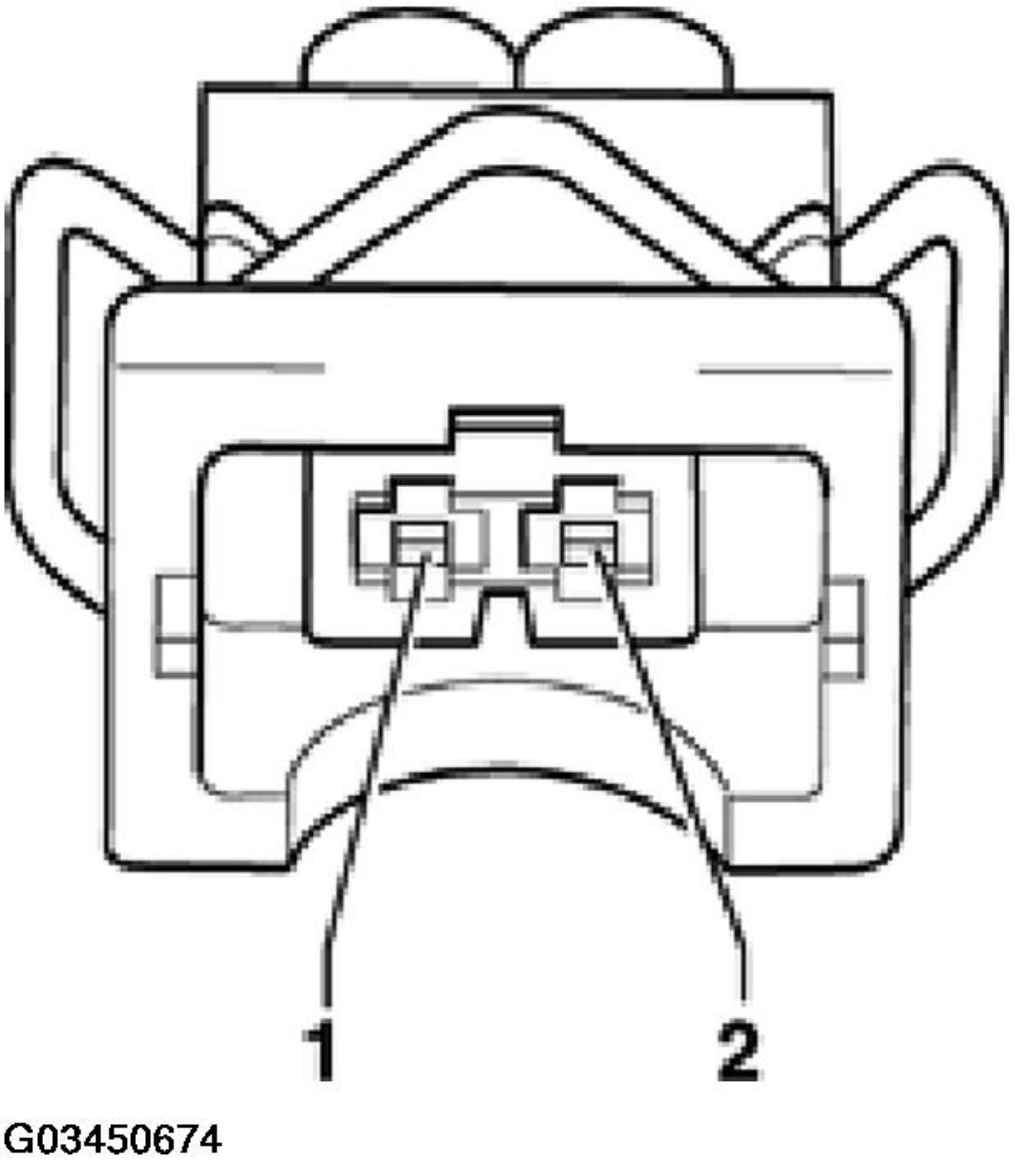

Fig. 8: Identifying Wastegate Bypass Regulator Valve Harness Connector Terminals
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Switch ignition off.

If specified value is not obtained:

- Connect test box to control module wiring harness. See **TEST BOX, CONNECTING FOR WIRING TEST** .

Vehicles with 80-pin control module

- Check for open circuits in wires between test box and connector according to wiring diagram.

  Terminal 1 + socket 2 and 28

  Terminal 2 + socket 15

  Wire resistance: max. 1.5 ohm

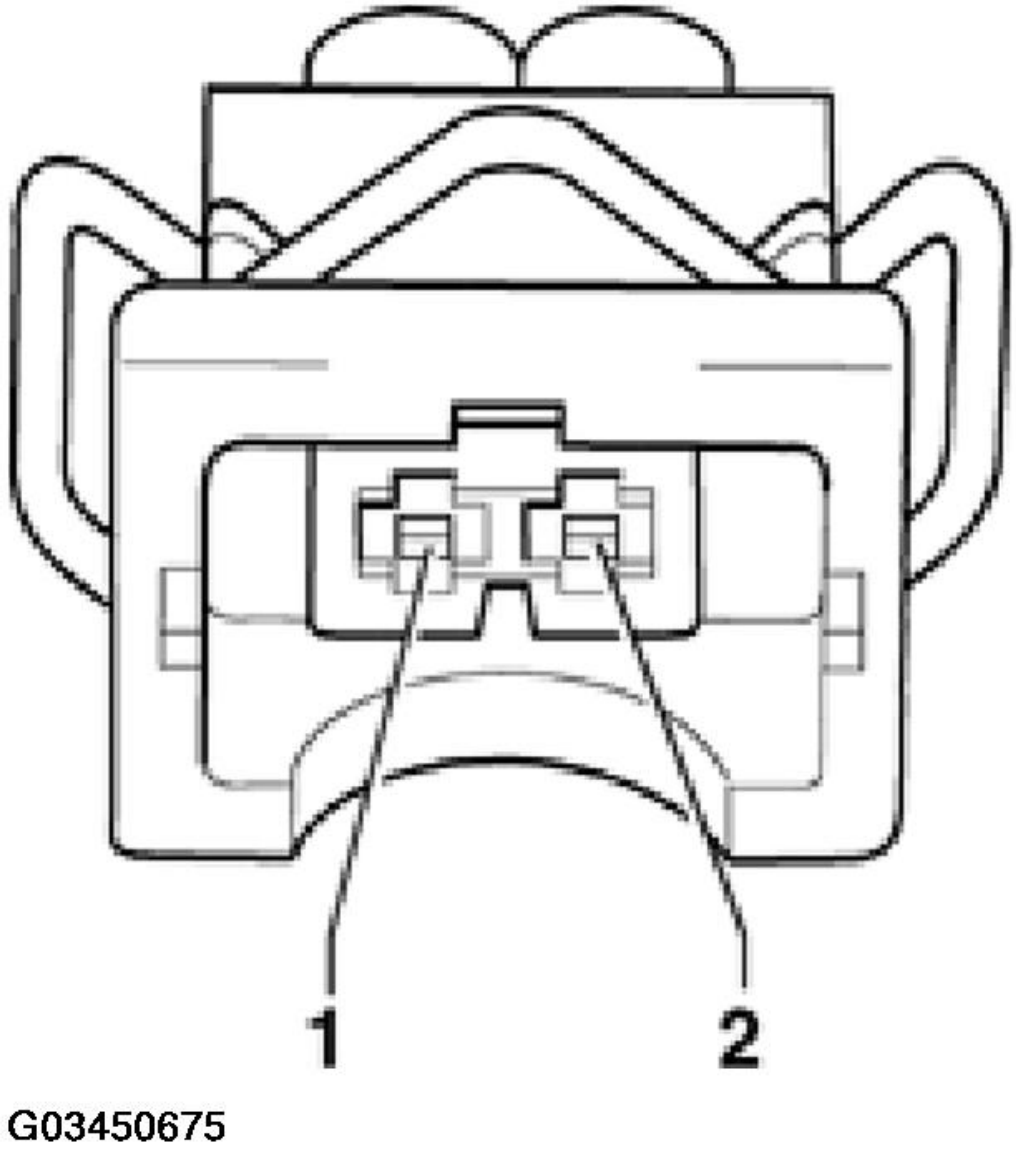

Fig. 9: Identifying Wastegate Bypass Regulator Valve Harness Connector Terminals (80-Pin ECM)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Vehicles with 121-pin control module

- Check for open circuits in wires between test box and connector according to wiring diagram.

  Terminal 2 + socket 62

Wire resistance: max. 1.5 ohm

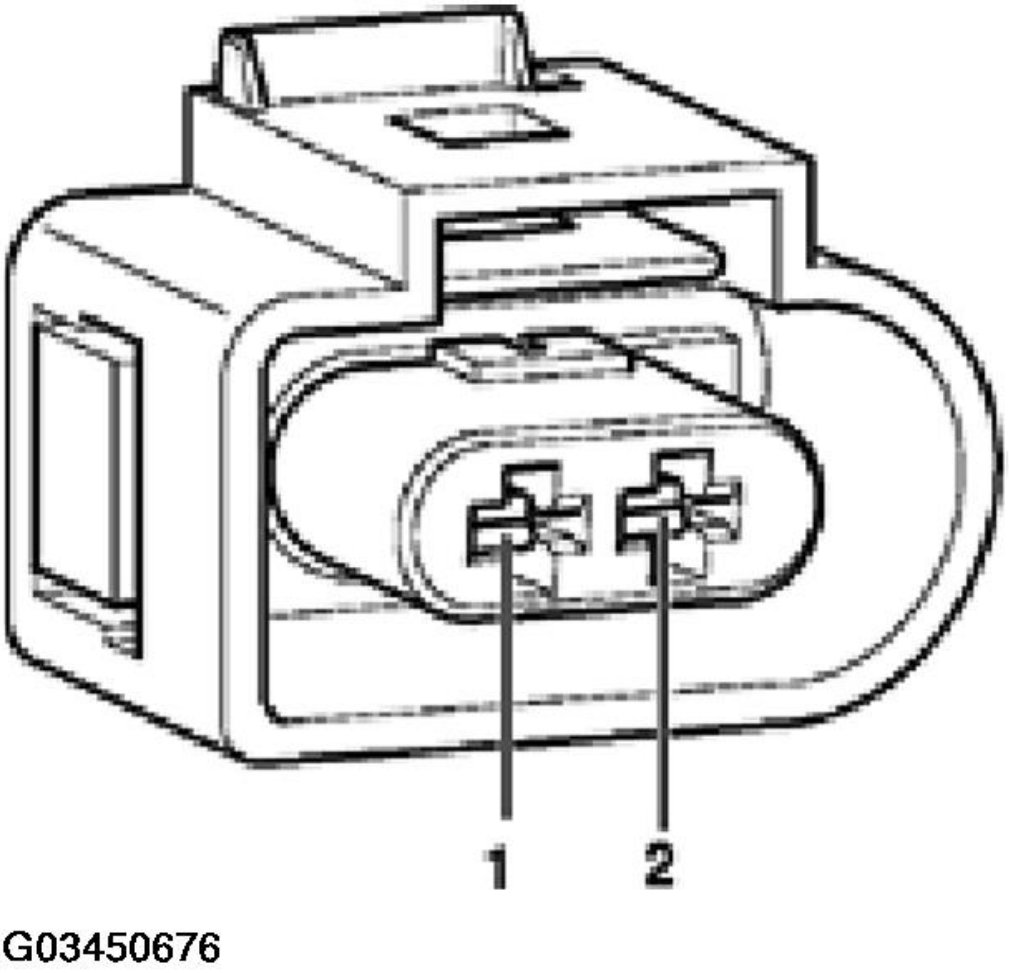

Fig. 10: Identifying Wastegate Bypass Regulator Valve Harness Connector Terminals (121-Pin ECM)
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Check the wire to terminal 1 according to wiring diagram.

  See appropriate System Wiring Diagram article.

Continuation for all vehicles

- Also check wires for short circuit to each other, to vehicle Ground (GND) and to B+.

Specified value: INFINITY ohm

If no malfunctions are found in wires:

- Replace Diesel Direct Fuel Injection (DFI) Engine Control Module (ECM) -J248-. See CONTROL MODULE FOR DIESEL-DIRECT FUEL INJECTION SYSTEM, REPLACING .
- Erase DTC memory of control module for Diesel-Direct fuel injection system. See **DIAGNOSTIC MODE 4: RESET/ERASE DIAGNOSTIC DATA** .
- Generate readiness code. See **READINESS CODE, GENERATING** .

CHARGE AIR SYSTEM WITH TURBOCHARGER

SAFETY PRECAUTIONS

CAUTION: When performing repair work, especially due to the confined conditions in the engine compartment, pay attention to the following:

- **Route all types of hoses/lines (e.g. for fuel, hydraulics, EVAP system, coolant, refrigerant, brake fluid and vacuum) as well as electrical wiring so that the original positions are restored.**
- **Ensure sufficient clearance to all moving or hot components.**

Observe following if test and measuring instruments are required during a road test:

- Test and measuring instruments must be secured to rear seat and operated by an assistant from this location.

If test and measuring instruments are operated from front passenger's seat and the vehicle is involved in an accident, there is a possibility that the person sitting in this seat may receive serious injuries when the airbag is triggered.

RULES FOR CLEANLINESS

When working on exhaust gas turbocharger, pay careful attention to the following rules:

- Thoroughly clean all unions and adjacent areas before disconnecting.
- Place parts that have been removed on a clean surface and cover. Do not use fluffy cloths!
- Carefully cover opened components or seal if repairs cannot be performed immediately.
- Only install clean components:

  Only unpack replacement parts immediately prior to installation. Do not use parts that have been stored loose (e.g. in tool boxes etc.).

- Only unpack and remove protective caps immediately prior to installation.
- Clean oil from connection pieces and hose ends when repairing.
- When the system is open:

  Do not work with compressed air if this can be avoided. Do not move vehicle unless absolutely necessary.

TURBOCHARGER SYSTEM COMPONENTS, REMOVING AND INSTALLING

Observe safety precautions, See **CHARGE AIR SYSTEM WITH TURBOCHARGER** .

Observe rules for cleanliness, See **RULES FOR CLEANLINESS** .

- Hoses are secured by clamps or retaining clips.
- For installing the spring-type clips, assembly tool VAS 5024 A is recommended.
- Charge air hoses and lines connections must be free of oil and grease before reinstalling.
- Do not install hoses with lubricants, moisten hose only with water, if necessary.
- Charge air system must be free of leaks.
- Fill turbocharger with engine oil through oil connection before connecting the oil supply line
- Allow the engine run for approx. 1 minute at idling speed after having installed the turbocharger and do not do not rev up immediately. This ensures the lubrication of the turbocharger.
- Replace self-locking nuts.

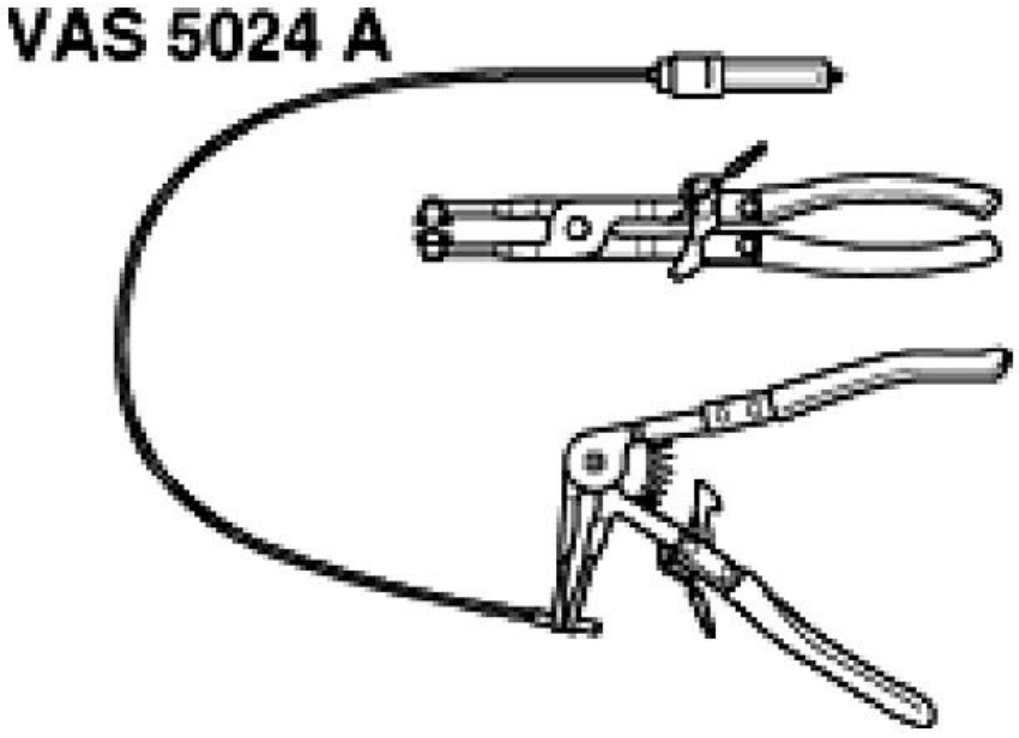

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Fig. 1: Identifying VAS 5024 A Assembly Tool
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Hoses with quick release coupling

NOTE: All hoses of the charge air system are secured with hose clips or with quick release couplings. When using quick release couplings the following points must be observed:

- Unlock quick release coupling by pulling securing clamp (arrow). Separate hose/tube without assistance of tools.

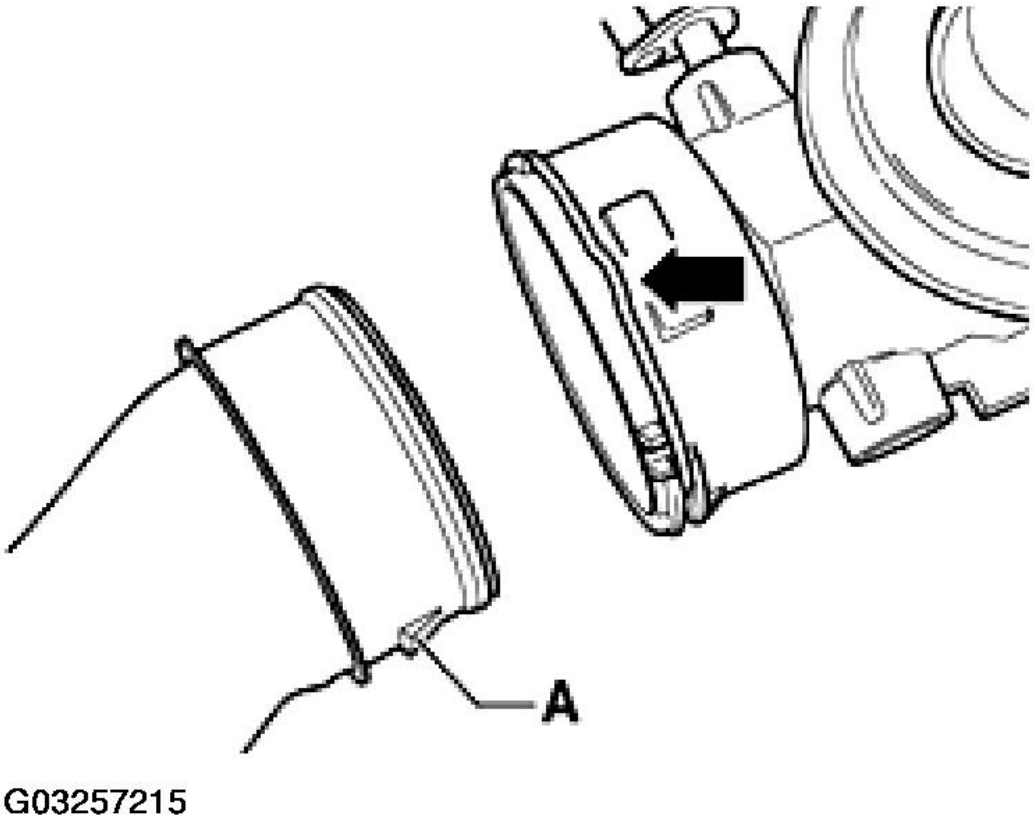


Fig. 2: Unlocking Quick Release Coupling By Pulling Securing Clamp
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- When installing check for secure fit of tabs -A-.

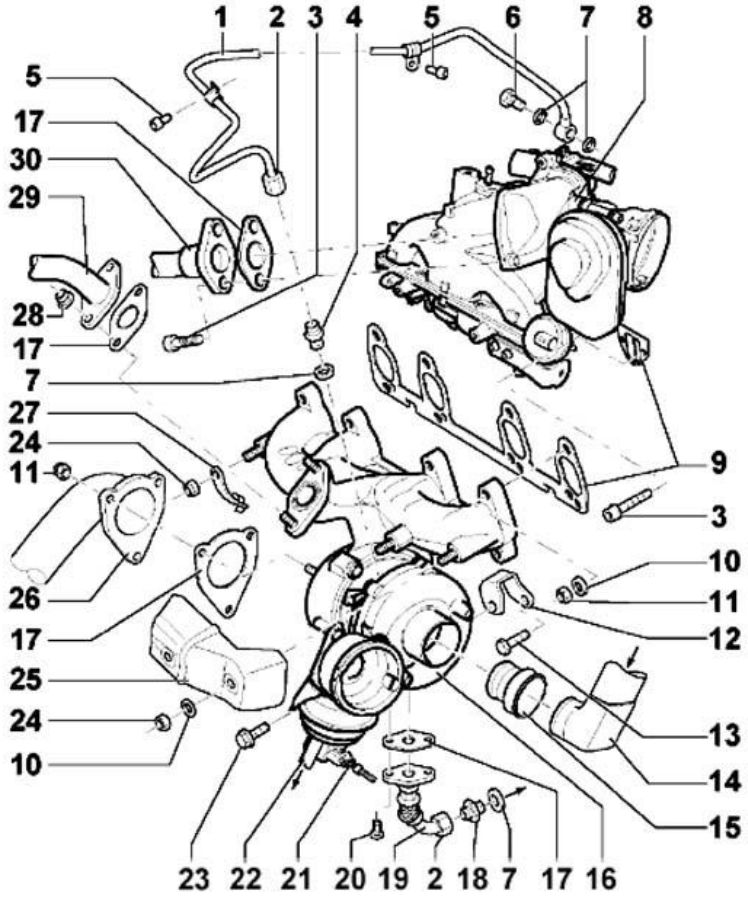
NOTE: The following list refers to items in Fig. 3 .

1. **Oil supply line**
   - From oil filter bracket. See **PART 2: DISASSEMBLING OIL FILTER BRACKET** .
   - Fill with engine oil through oil connection before connecting oil supply line.
   - Removing and installing, See **PART 3: REMOVING AND INSTALLING OIL RETURN LINE** .
2. **Union nut**
   - Prescribed torque, see **PART 3: REMOVING AND INSTALLING OIL RETURN LINE** .
3. **22 N.m**
4. **Pipe union, 30 N.m**
   - Always replace
   - Oil threads and contact surfaces with G 052 112 A3.
   - Fill with engine oil through oil connection before connecting the oil supply line.
5. **Bolt/screw**
   - Prescribed torque, See **PART 3: REMOVING AND INSTALLING OIL RETURN LINE** .
6. **Banjo bolt**
   - Prescribed torque, See **PART 3: REMOVING AND INSTALLING OIL RETURN LINE** .
7. **Seal**
   - Always replace
8. **Intake manifold**
9. **Seal**
   - Always replace
   - Note installed position.
10. **Washer**
11. **25 N.m**
    - Always replace
12. **Bracket**
    - Between turbocharger and cylinder block
13. **40 N.m**
    - Hand-tighten all bolts first
14. **Connecting line**
    - Air filter/turbocharger
15. **Transition piece**
16. **Turbocharger**
    - Only replace as assembly
    - Removing: remove right axle shaft at transmission:

      See **FRONT AXLE SHAFT** .

- Allow engine to run for approx.1 minute at idling speed after installing turbocharger; to ensure oil supply is guaranteed, do not rev up immediately

17. **Seal**
    - Always replace
18. **Pipe union, 40 N.m**
19. **Oil return line**
    - To cylinder block
20. **17 N.m**
21. **Connector**
    - For Turbocharger (TC) Vane Position Sensor -G500-
22. **Vacuum hose**
    - to Wastegate Bypass Regulator Valve -N75-
    - Vacuum hoses for connection diagram, See **VACUUM HOSE CONNECTION DIAGRAM** .
23. **20 N.m**
    - Hand-tighten all bolts first
24. **20 N.m**
    - Always replace
25. **Heat shield**
26. **Front exhaust pipe**
27. **Bracket**
    - For oil return line item 1
28. **22 N.m**
    - Always replace
29. **Connecting line**
    - To bypass flap for exhaust gas recirculation, see **EXHAUST GAS RECIRCULATION SYSTEM COMPONENTS, REMOVING AND INSTALLING** .
30. **Connecting line**
    - From bypass flap for exhaust gas recirculation, see **EXHAUST GAS RECIRCULATION SYSTEM COMPONENTS, REMOVING AND INSTALLING** .



1 - Oil supply line
2 - Union nut
3 - 22 Nm
4 - Pipe union, 30 Nm
5 - Bolt/screw
6 - Banjo bolt
7 - Seal
8 - Intake manifold
9 - Seal
10 - Washer
11 - 25 Nm
12 - Bracket
13 - 40 Nm
14 - Connecting line
15 - Transition piece
16 - Turbocharger
17 - Seal
18 - Pipe union, 40 Nm
19 - Oil return line
20 - 17 Nm
21 - Connector
22 - Vacuum hose
23 - 20 Nm
24 - 20 Nm
25 - Heat shield
26 - Front exhaust pipe
27 - Bracket
28 - 22 Nm
29 - Connecting line
30 - Connecting line

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Fig. 3: Exploded View Of Turbocharger & Intake Manifold Components
Courtesy of VOLKSWAGEN OF AMERICA, INC.

CHARGE AIR COOLING COMPONENTS, REMOVING AND INSTALLING

Observe safety precautions, See **CHARGE AIR SYSTEM WITH TURBOCHARGER** .

Observe rules for cleanliness, See **RULES FOR CLEANLINESS** .

NOTE: All hoses of the charge air system are secured with hose clips or with quick release couplings. When using quick release couplings the following points must be observed:

- Unlock connection by pulling securing clamp (arrow).

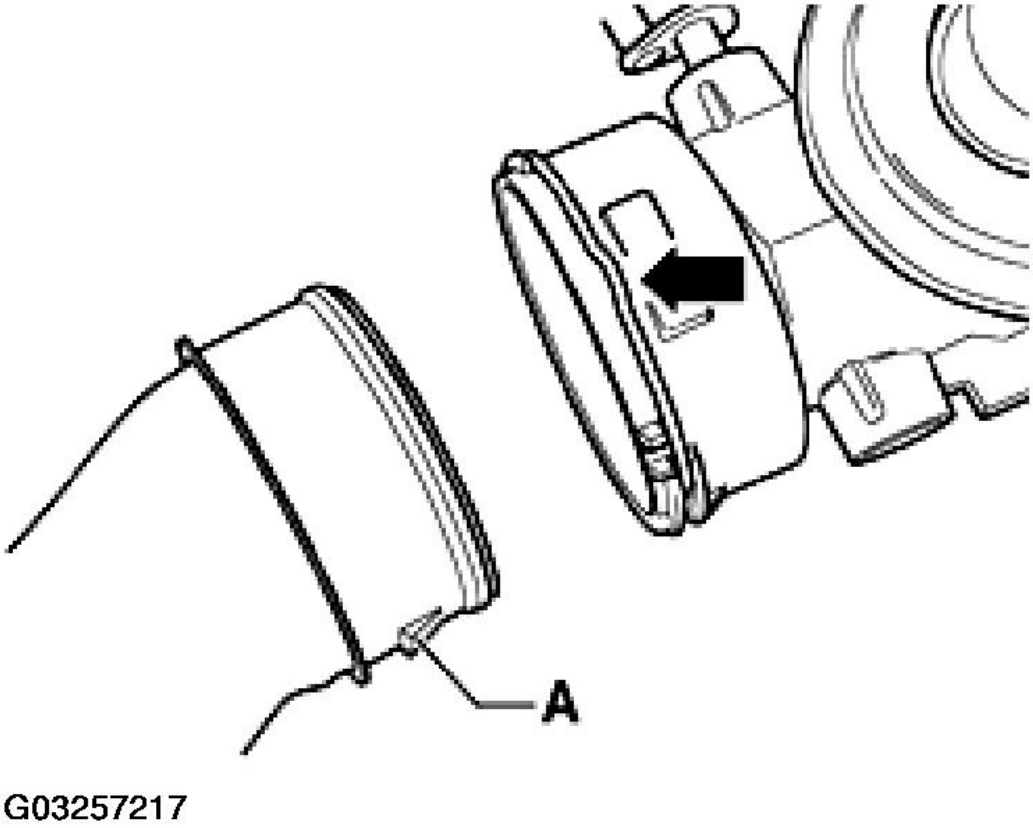

Fig. 4: Unlocking Connection By Pulling Securing Clamp
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove hose/tube without assistance of tools.
- When installing check for secure fit of tabs -A-. See **Fig. 4** .
- Use assembly tool VAS 5024 A to install spring-type clips.

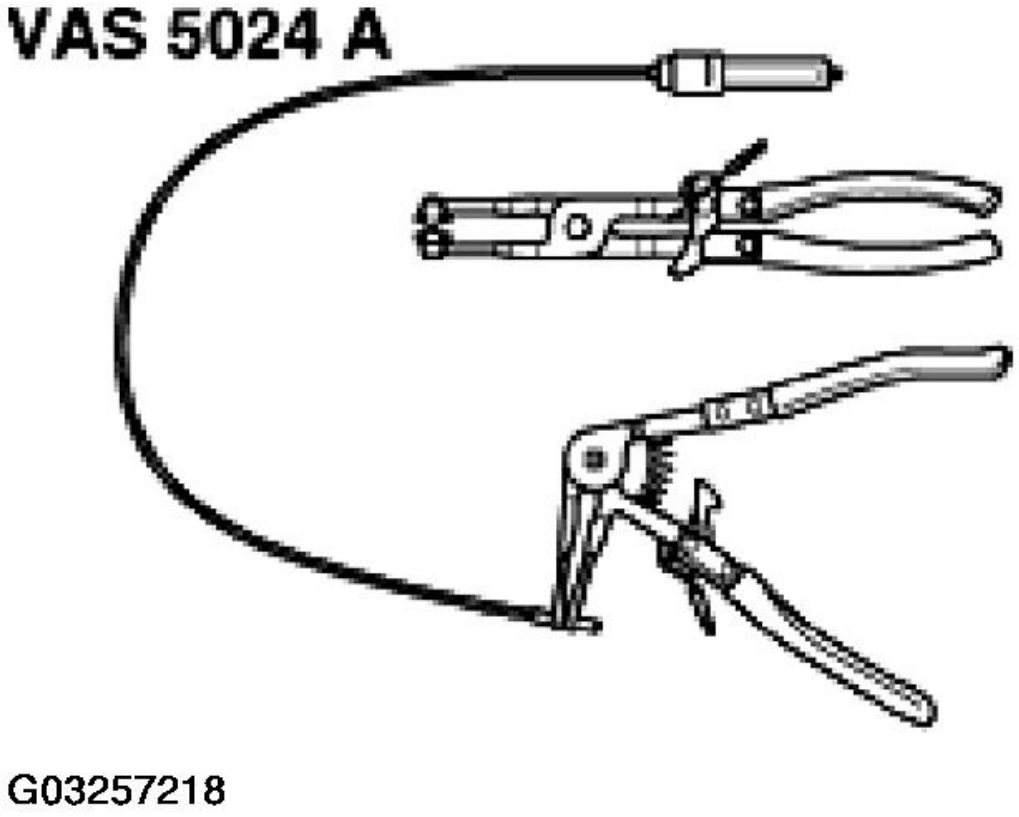

Fig. 5: Installing Spring-Type Clips Using VAS 5024 A Assembly Tool
Courtesy of VOLKSWAGEN OF AMERICA, INC.

NOTE:

- **Charge air hoses and lines connections must be free of oil and grease before reinstalling.**
- **Do not install hoses with lubricants, moisten hose only with water, if necessary.**
- **Charge air system must be free of leaks.**

NOTE: The following list refers to items in Fig. 6 .

1. **Air duct**
2. **Charge air cooler**
   - Removing and installing, See **CHARGE AIR COOLER, REMOVING AND INSTALLING**
3. **5 N.m**

4. **Manifold Absolute Pressure (MAP) sensor -G71- with Intake Air Temperature (IAT) sensor -G72-**
5. **O-ring**
    - Replace if damaged.
6. **10 N.m**
7. **Tube connection piece**
8. **Upper charge air pipe**
9. **Connecting hose**
    - Upper charge air pipe/intake manifold flap
10. **To intake manifold flap**
11. **From air cleaner**
12. **From crankcase ventilation/ cylinder head cover**
13. **Rear charge air line**
    - With Positive Crankcase Ventilation (PCV) heating element -N79-
14. **Connecting hose**
    - Rear charge air pipe/exhaust turbocharger
15. **Bracket**
16. **Connecting hose**
    - Exhaust turbocharger/lower charge air line
17. **Turbocharger**
18. **Lower charge air pipe**

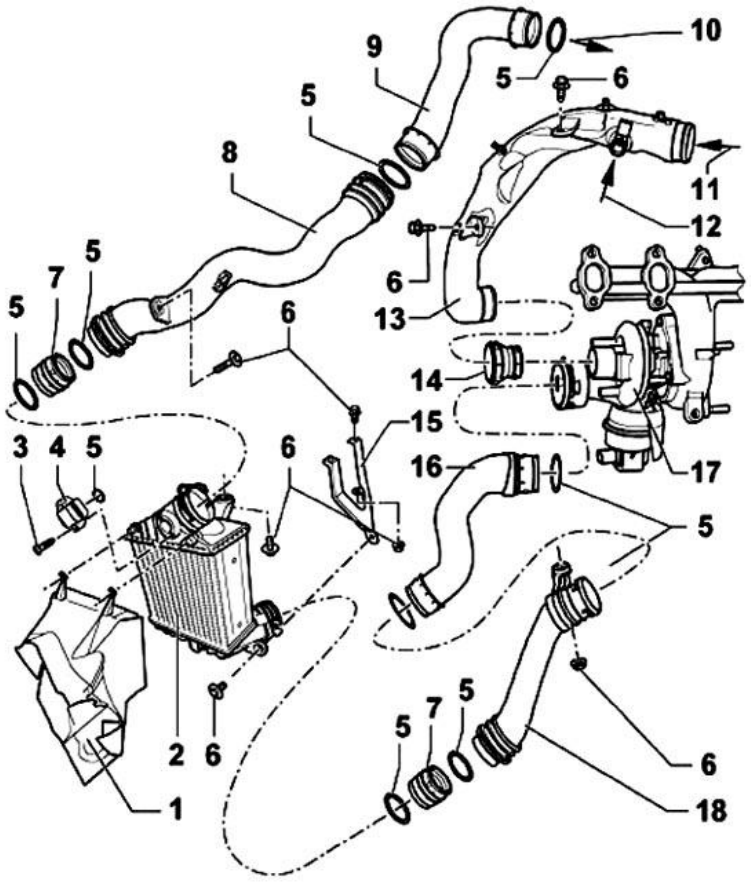
1 - Air duct
2 - Charge air cooler
3 - 5 Nm
4 - Manifold Absolute Pressure (MAP) sensor -G71- with Intake Air Temperature (IAT) sensor - G72-
5 - O-ring
6 - 10 Nm
7 - Tube connection piece
8 - Upper charge air pipe
10 - To intake manifold flap
11 - From air cleaner
12 - From crankcase ventilation/ cylinder head cover
13 - Rear charge air line
14 - Connecting hose
15 - Bracket
16 - Connecting hose
17 - Turbocharger
18 - Lower charge air pipe
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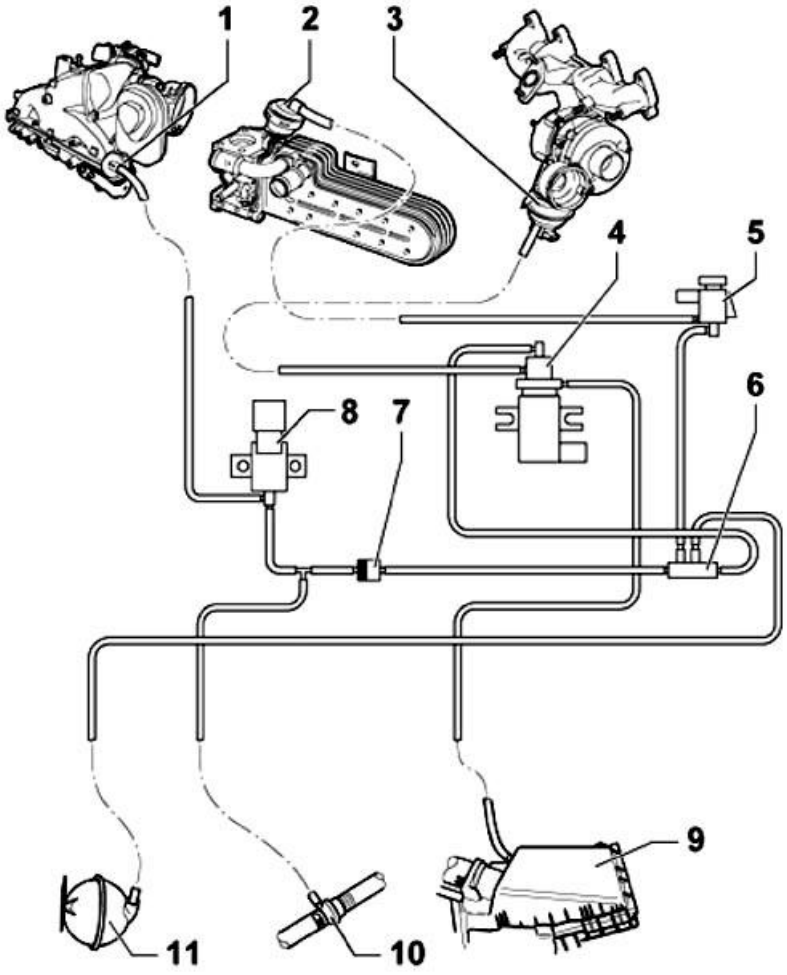
Fig. 6: Exploded View Of Charge Air Cooler Components
Courtesy of VOLKSWAGEN OF AMERICA, INC.

VACUUM HOSE CONNECTION DIAGRAM

NOTE: The following list refers to items in Fig. 7 .

1. **Vacuum unit**
   - For variable intake manifold
2. **Vacuum unit**
   - For bypass flap for exhaust gas recirculation cooler
3. **Vacuum unit**
   - For charge pressure control
   - Integral part of turbocharger cannot be replaced
4. **Intake Manifold Runner Control (IMRC) valve -N316-**
   - Installed position, See **Fig. 8**
5. **Non-return valve**
   - White connection to distributor, item 8
6. **Wastegate bypass regulator valve N75-**
   - Installed position, See **Fig. 8**
7. **Exhaust Gas Recirculation (EGR) cooler switch-over valve -N345-**
   - Installed position, See **Fig. 8**
8. **Distributor**
9. **Air cleaner**
10. **Vacuum union**
    - Between tandem pump and brake booster
    - With non-return valve
11. **Vacuum reservoir**



1 - Vacuum unit
2 - Vacuum unit
3 - Vacuum unit
4 - Intake Manifold Runner Control (IMRC) valve - N316-
5 - Non-return valve
6 - Wastegate bypass regulator valve N75-
7 - Exhaust Gas Recirculation (EGR) cooler switch-over valve -N345-
8 - Distributor
9 - Air cleaner
10 - Vacuum union
11 - Vacuum reservoir

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Fig. 7: Turbocharger Vacuum Hose Connection Diagram
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Solenoid valves, installed position

The bracket with the solenoid valves is installed onto plenum chamber sealing cover right side.

The valve connectors are not coded, only the protective sleeves are different.

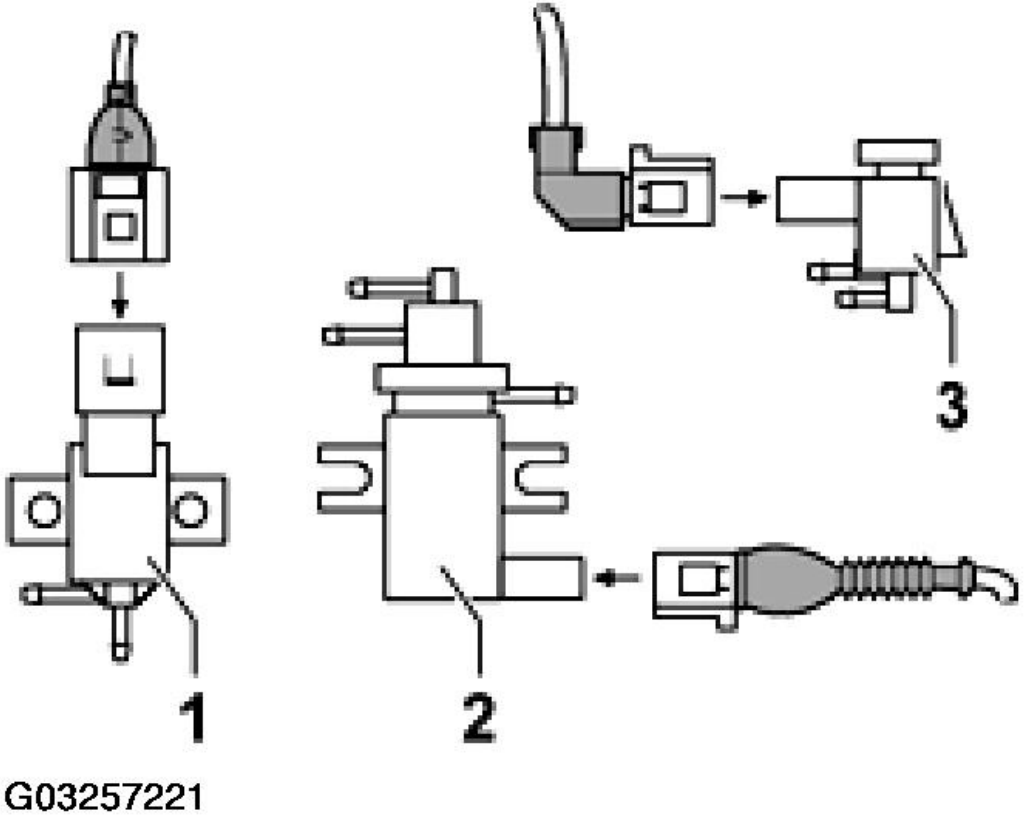

Fig. 8: Identifying Solenoid Valves Installed Position
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Connector application

SOLENOID VALVE CONNECTOR APPLICATION

No.	Component	(1) Connector
1	Intake Manifold Runner Control (IMRC) Valve -N316-	with straight protective sleeve
2	Wastegate Bypass Regulator Valve -N75-	with rubber grommet
3	Exhaust Gas Recirculation (EGR) Cooler Switch-over Valve -N345-	with angled protective sleeve
(1) To identify connectors, see **Fig. 8** .		

CHARGE AIR COOLER, REMOVING AND INSTALLING

Removing

- Remove upper charge air pipe -1- with connecting hose -2- by removing bolt/screw -3- and releasing connector (arrow).

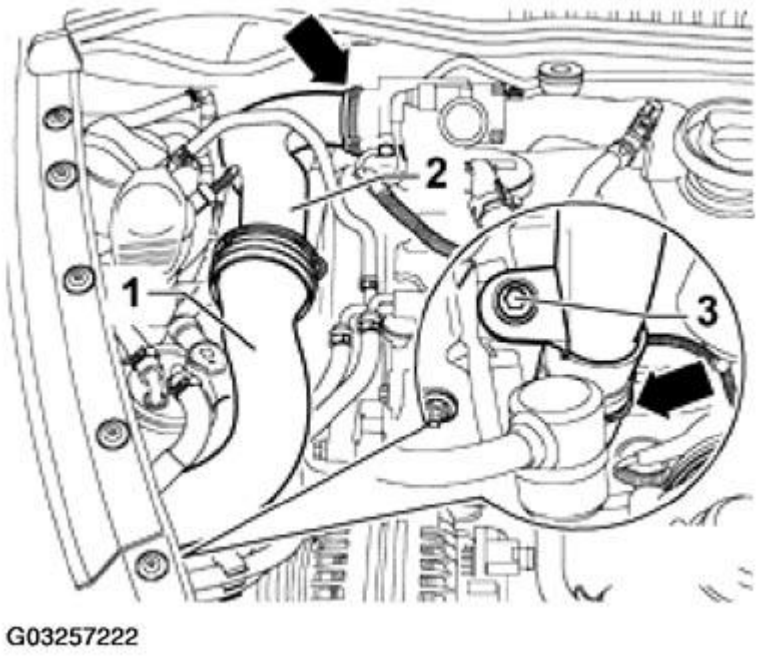

Fig. 9: Removing Upper Charge Air Pipe With Connecting Hose By Removing Bolt/Screw And Releasing Connector
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove front turn signal, right side.

  See **FRONT TURN SIGNAL LIGHTS, REMOVING AND INSTALLING** .

- Disconnect connector (arrow) from Manifold Absolute Pressure (MAP) sensor -G71- with Intake Air Temperature (IAT) sensor -G72-.
- Remove front right wheelhouse liner.

  See **FRONT WHEEL HOUSING LINER, ASSEMBLY OVERVIEW**

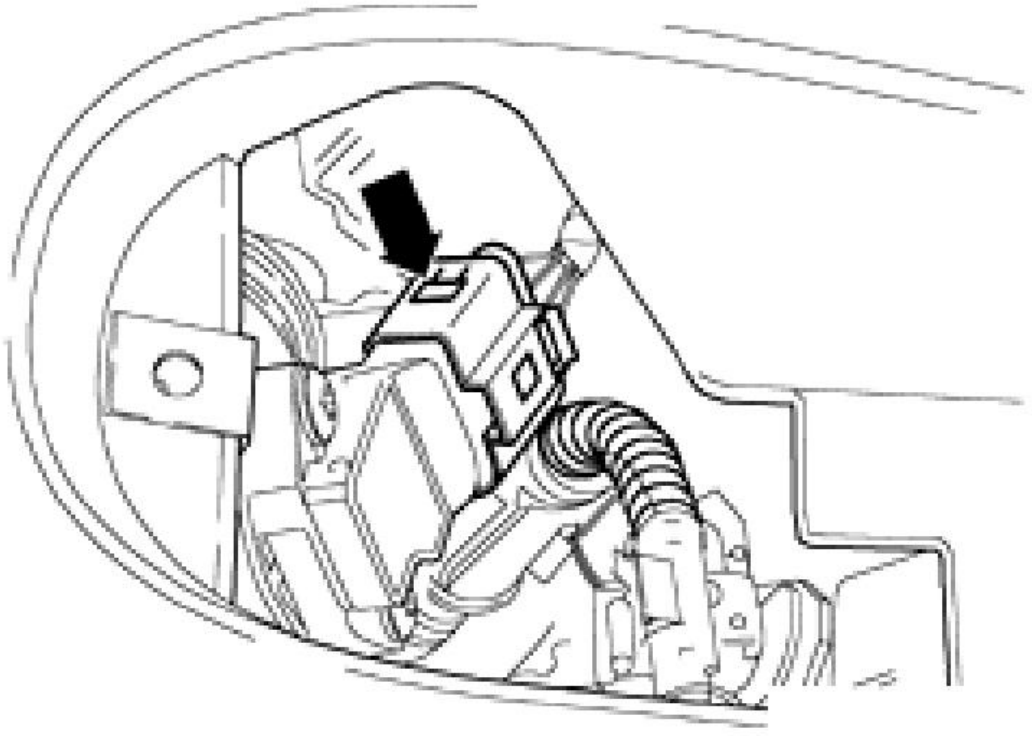

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Fig. 10: Disconnecting Connector From Manifold Absolute Pressure Sensor
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove lower charge air pipe -1-.
- Remove bolt/screw -2- and release connector (arrow).

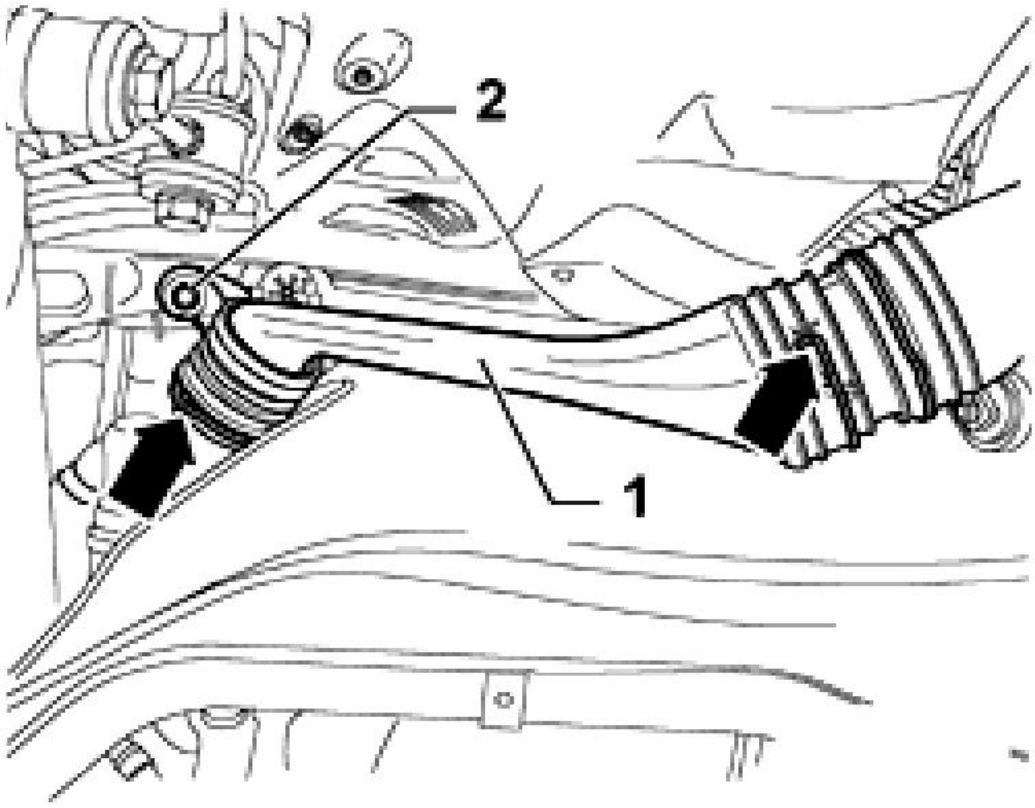

Fig. 11: Removing Lower Charge Air Pipe
Courtesy of VOLKSWAGEN OF AMERICA, INC.

- Remove center and right side sound insulation.
- Remove charge air cooler securing bolts (arrows).

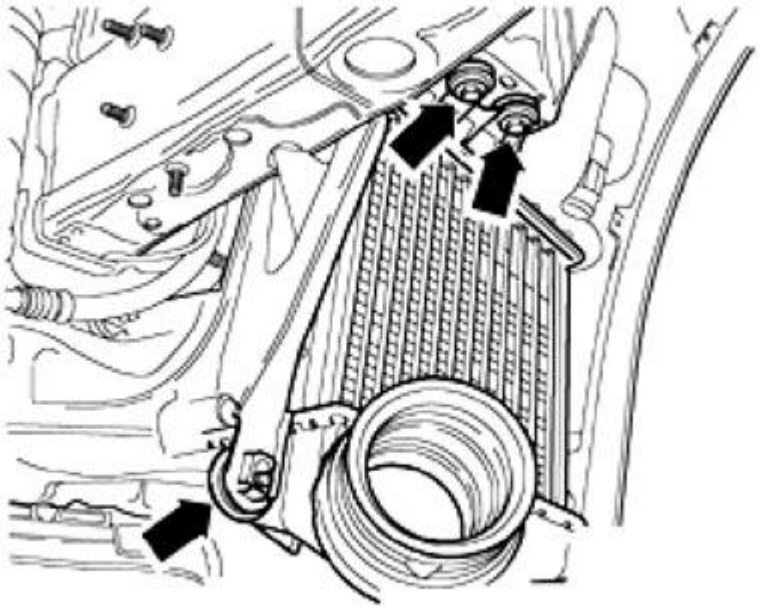

Fig. 12: Removing Charge Air Cooler Securing Bolts
Courtesy of VOLKSWAGEN OF AMERICA, INC.

Installing

Install in reverse order.